POPULAR AVIATION

Combined With

Aeronautics

A magazine for every one interested in Gliders—Light Airplanes—Models

Volume 7 AUGUST, 1930 Number 1

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NOTICE

With this issue POPULAR AVIATION absorbs AERONAUTICS, formerly known as "The Quality Magazine of the Field."

The combined publication, POPULAR AVIATION and AERONAUTICS will retain the best features of both magazines, which should guarantee the finest selection of writers on aeronautical subjects ever presented.

In order to catch up with our new printing schedule, the present issue instead of being called the July issue is called the August issue although it is published one month after the June issue.

Twelve issues will be published this year as usual, the October number merely being released on the normal release date of an August Issue.

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Illustrated by
Herman R. Bollin

How We Shot Down Immelmann

This remarkable story is being told for the first time. It gives the inside story of how the British squadron set a trap for the great German ace, and sent him to his death.

By CAPTAIN JACK C. BURSEY, R. A. F.*

THE exploits of Baron Manfried von Richtoffen, Germany's premier war ace have been publicized all over the world. Everybody has heard or read about the redoubtable "Red Knight of Germany," but comparatively few people are aware that there was another German ace who fought and died before the famous Baron "did his stuff" over Flander's Fields. Captain Immelmann, the pilot to whom I refer, was an expert pilot—cool in the face of danger—reasoning things out before they happened, with the result that he was the first to discover and use the now famous "Immelmann turn," a wonderfully efficient maneuver used to evade an enemy plane diving on one's tail.

Immelmann was a thorn in the side of British airmen, and he had nearly half a hundred planes to his credit before he met the fate of many of the bravest pilots who ever flew. The story of his last battle is being chronicled here for the first time, and in this little history you will read something of life at the front.

Immelmann used to fly a single seater plane, painted blue, and in nearly every battle he was alone. Before going into the details of his last fight, I would like to point out the fact that at the time of these events (1917) the Royal Flying corps were practically licked to a standstill because of the superiority of the enemy planes. Where the ships that we used to chase all over the sky were capable of a top speed of 95 miles an hour, the enemy in Fokker D.VII's could make us like it because they could crash through the air at something like 125-130 miles an hour. Ask any war time pilot just how much of an advantage 30 miles an hour is in extra speed!

NOW Immelmann wasn't exactly satisfied with this advantage in speed—the matchless courage of some of the British pilots tended to balance things up, so he evolved the idea of adding the element of surprise to his attacks. Here's how he did that. On days when there were clouds in the sky, and there were many days like that in France, Immelmann would climb up into the clouds and hide in them. Not hide in the sense of trying to avoid a fight, but so that he couldn't be seen by any of our boys. Occasionally he would drop down out of his hiding place to see what he could see, and sooner or later he would pop out just in time to see an antiquated plane flying along perhaps a thousand feet below him. That's when the action started—nearly always resulting in the complete extinction of the lower ship. A few short, sharp, well-directed bursts of machine gun fire would be directed at the all unsuspecting pilot, and almost immediately he would start that long dive earthward with the plane completely smothered in black smoke and lurid flames.

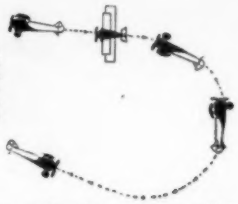
After a victory such as this Immelmann would climb back into the clouds again, there to await another opportu-

**Capt. Bursey was awarded a special proficiency medal by the British Air Board for being one of the 12 best all around pilots in the Royal Air Force during the war. He was also a Captain in the Air Intelligence Division branch of the British Secret Service.*

nity to add to his ever mounting list of crashed planes.

It was my pleasure to be a member of the famous 29th Squadron, Royal Flying corps at this time—the squadron that in August 1918 made a record never equalled on any front—destroying 55 enemy planes and 17 enemy observation balloons in one month of hard fighting without losing a pilot either killed or wounded. And in those days it was necessary for us to go anywhere from ten to thirty miles on the enemy side of the lines to get into any scraps! Yet fifty per cent of the casualties in my squadron were caused by Captain Immelmann. So you can see that we did not harbour any very pleasant thoughts in our hearts about this opponent.

ONE night while we were at dinner the conversation turned to the events of the day. It had been a very disastrous day for us—three of our best boys had taken that long plunge into Eternity—their planes wreathed in smoke and flames—and two of them had been sent there by Immelmann. The three vacant places at the dinner table were mute testimony to the excellence of the enemy's shooting, and immediately after we had drunk a toast to the memory of our dead buddies, we set about formulating plans whereby we could rid the skies forever of this powerful menace. Many and varied



The famous Immelmann Turn. It allows the pilot to reverse his direction and gain altitude at the same time.

were the plans submitted. One pilot offered, in all seriousness to fly his plane deliberately into the plane flown by Immelmann—colliding with him at full speed to ensure his death. But of course that plan was discarded immediately. Finally a scheme was suggested that sounded good.

We planned that one plane would go into the air and fly about below the clouds, the pilot to be flying in such a manner as to convey the impression to Immelmann that he was a new pilot to war flying. The plane he was to fly would be of an obsolete type—but strengthened in every manner possible, and with a brand new motor installed. Also it would have a special rocket gun attached to the center section struts that would fire a rocket straight up into the air for about three thousand feet. Five more pilots would take their planes up above the clouds and simply wait there for the rocket to appear, telling them that their target had been lured away from his haven, the clouds. Then they would dive down with their motors wide open and come down to the rescue of the lone pilot acting as a bait. That was the plan.

Then followed the real argument. Who would go on the trip, and who would be the lucky (?) one to fly below the clouds? Everybody wanted to go—in fact it got so bad that there was almost a fight about it. However the matter was settled in truly British fashion—and when the results were declared there were no dissenters. There were fifteen active pilots in the squadron, and we simply divided up into five groups of three men, or rather boys, for that's all most of us were—and we all started with an equal amount of money, and played cold hands of poker for exactly one hour. The man in each group who had the most money at the end of the hour's play would form one of the patrol to fly above the clouds. The five men were eventually declared, and then came the task of selecting one of the remaining ten for the offering—and we hoped that it wouldn't be a burnt offering. To determine who should have the honor of acting in this capacity we resorted to straws. Ten straws were

"It seemed to me down below that they were toying with him as a cat does with a mouse, and then suddenly there came the death blow."

prepared—one of them shorter than the rest, and the ten men who had lost in poker each drew a straw.

GENERALLY our dining room was about as noisy a place after dinner as could be found anywhere in France, but as each man stepped forward to draw, there was a deathly silence. I was the fourth man to draw—and I am sure that the other boys each breathed a sigh of something approaching relief when they saw that I had drawn the fateful straw. For myself, I looked at that straw for fully half a minute before I could say anything, and then I ordered drinks for the crowd.

The next morning saw plenty of activity on the flying field. Between patrols we prepared the sacrificial plane—installing extra flying and drift wires, changing the motor and generally preparing the plane for a long dive such as it was not intended for. I also installed on the rim of the cockpit a rear vision mirror that would help me to see back of me without turning

"In the next second the plane burst into flames. Immelmann had paid! The deaths of our comrades had been avenged."

round, and in a couple of days we were all set for the adventure.

We had to wait for an ideal day—clear enough for flying, but with enough clouds around to make it possible for Immelmann to hide. There was not long to wait, and on the morning of the fateful day, I walked out to the hangar and gave the old crate a final look over to see that everything was all right. As I climbed into the cockpit there was silence—deep silence broken only by the mechanics "Switch off, gas on" and then, "Contact." After a few futile swings the wheezy old motor finally coughed into life, and I throttled it down so that it could get properly warmed up. I climbed out to smoke a cigarette—possibly my last one, and then went into a little last minute conference with the five escort pilots. That finished with, I returned to my ship, climbed in, fastened my safety belt and swung round into the wind ready for the take off. As I opened the

Captain Jack Bursey, author of this intriguing tale, and the decoy who lured Immelmann to his death, is shown in the cockpit of his plane.

throttle wide there came a cheer from the mechanics and pilots, and after a long run the old plane finally lifted itself into the air and I started my long climb up to the clouds.

SOON I saw a reassuring sight — the five planes that would dive to help me, I hoped, climbed past me to their positions above the clouds. They looked mighty good to me then, and the pilots waved to me as they passed. Again my thoughts tried to jump a half hour or so ahead, and I wondered if they would be in time to draw me from the devilish machine guns of Immelmann. It was just at that time that a most disturbing fact came to me! In all of our plans and preparations we had forgotten to equip my plane with machine guns! Try and imagine how you would have felt, climbing toward a battle with the Ace of Aces of the enemy air services and no guns on the plane! For a moment I was tempted to turn back, but I thought of the other boys above me who would do all the shooting necessary. At least, I hoped that they would! About three miles on the enemy side of the front line trenches I saw a fine thick bank of clouds that looked as though they would be an ideal spot for our enemy to conceal himself in, and with motor throttled down I proceeded to fly around in wide circles right underneath them. I acted as though I had been sent on an observation trip for my first visit to the lines, and after half an hour of such flying I was gratified to see a blue plane dive gently out of the clouds.

A blue streak—Immelmann! I saw him before he saw me—which gave me a break, but it wasn't very long until he spotted what looked like an easy prey. I watched him from out of the corner of my eye—flying along with one hand on the control stick and the other on the trigger of the rocket gun. As Immelmann started to increase his dive toward me I stuck the nose of my ship down slightly, and he came after me. There seemed to have come to me a feeling of complete safety—and I also seemed to sense that Immelmann wouldn't shoot at me until he got in close enough to be sure of getting me with his first burst. Gradually I put the nose further down until my old crate vibrated enough to have made it fall to pieces had it not been strengthened. And Immelmann came after me!

He was falling into the trap! Perhaps his thoughts were that he could have a little fun by scaring a new pilot, but he did not keep this in mind very long, for suddenly his ship was put into an almost vertical dive. Just at that time, mine also went into a vertical dive, but not before I pulled the trigger which sent my red rocket of distress upwards into the clouds. When friend Immelmann saw that rocket he must have realized that he was in a tough corner, for he momentarily pulled out of his dive, and looked back. Seeing nothing, he returned to the attack, and right then is when my heart started to beat really fast. I thought to myself, "My God, the rocket hasn't reached them!" I don't know how long it took the boys to come down through the clouds, but there was never a more welcome sight in all of my life when I saw those five Nieuports diving down with motors wide open!

IMMELMANN saw them at the same time that I did, I think, for he forgot all about me right then, and tried to turn back in one of his famous turns to the shelter of his sky harbor. Too late! The five Nieuports rapidly assumed battle formation — the well known "V"—and they proceeded to encircle our adversary. I looked upward, and against the mistiness of the clouds forming the background, I saw them hem Immelmann into a trap that no amount of good flying would have gotten him out of. Closer and closer they got — Immel- *(Concluded on Page 77)*

An extraordinary air picture showing a "sausage" being launched from an airplane and taking fire, above the aviation camp at Le Bourget, France.

Aerial Rules for Aerial Fools

Dear Editor:

While going through some old war papers of mine I came across "Aerial Rules for Aerial Fools." This was actually used during the early training of "rookies" with R. A. F. (Royal Air Force) Most of the rules, if not all of them, still apply and I thought they might be of interest to the readers of POPULAR AVIATION. They might fill in a corner for you. Let me know what you think of them.

Yours very truly,
Douglas G. Jeffrey, R. A. F., D. S. O.

Dear Commander Jeffrey:

These rules are KNOCKOUTS! They cover every vital feature of student training.

You British flyers have an amusing, though rather mournful way of pounding lessons into yours rookies.

We are publishing your communication word for word, uncensored, just as you sent it to us.

When you find time, give your war files a thorough cleaning and send us some more sidelights on the R. A. F.

Very truly yours,
The Editor

1. INSPECT YOUR MACHINE VERY CAREFULLY. A few broken strands in your control wires may cause your family a lot of unnecessary trouble and worry later on.

2. ALWAYS TAKE OFF INTO THE WIND. The pilot who takes off with the wind is flirting with silver handles on his fuselage.

3. GRAB PLENTY OF SPEED BEFORE LEAVING THE GROUND. When you increase your flying speed you decrease your dying speed.

4. DO NOT TRY TO CLIMB STEEPILY. Lift the tail and let her take-off herself. Climbing angle and pilot should both be normal. *"Zoom" is often spelled with a "D".*

5. FIRST TURN MUST NOT BE MADE UNDER 500 ft. Watch your first *"bank"*—it's your *"savings account."* You may be side-slipling into ruin. Most "Birds" who have crashed on a take-off had no idea that the ground was coming up to kiss them "Good-bye."

6. DO NOT TURN IF TROUBLE COMES UNDER 500 ft. If you do YOUR troubles will be over (Under 6 ft.) If she CONKS on you, stick her nose down and glide straight ahead. The bump you give the hangar isn't half as bad as the bump the ground may give you.

7. DO NOT SPIRAL OR "S" TURN UNDER 500 ft. At that height be ready to glide straight ahead and land. When you turn near the ground, *keep your eye on it.* If your Altimeter is all wrong—so are *you.*

8. WHEN FLYING STRAIGHT — SAVE YOUR ENGINE. If type of motor permits,—reduce R. P. Ms. It adds to its life and yours.

9. INVARIABLY LAND INTO THE WIND. It helps to stop you. You save the crew some trouble if you "set her down" right inside the hangar, but remember,—"The *longer* you roll, the *shorter* you live."

10. AFTER LANDING, LOOK AROUND BEFORE YOU TURN. It may be your "bunkie" who is gliding behind you. If *you* don't care to live, at least try to manoeuvre so that *his* girl will still recognize him.

11. KEEP A SHARP LOOK-OUT IN THE AIR. Always remember that every other pilot is crazy but you. A "Sky-jazzer" has no time to read a book or go to sleep. Your engine may sound soft and soothing, but so does the voice of your family undertaker.

12. A MACHINE LANDING HAS THE RIGHT OF WAY. A dead stick may mean a dead aviator, so give him room. His gliding speed is greater than your takeoff, so if he "Tags" you, you're "It."

13. ALWAYS HAVE A GOOD LANDING FIELD IN GLIDING DISTANCE. That's the whole secret of Cross-country flying. If you've gotta come down, do it gracefully. A machine isn't much use to the Government when it has to be taxied home on a shovel.

14. DON'T LAND OUTSIDE WITHOUT AUTHORITY. Don't land beside an obviously wrecked machine if the pilot can be seen walking around. He usually is not in a good humor and *your* landing may not be so fortunate.

15. FASTEN YOUR SAFETY BELT. If your head strikes the cowl of the cockpit it saves the Dentist wiring up your jaws. The pilot who didn't have his belt fastened when he needed it, now wears his "Wings" on his back.

16. NO STUNTING UNDER 2000 ft. The pilot who loops, stalls, side-slips and spins just over the water tank, finally makes a perfect landing under a bouquet of sweet-smelling lilies.

17. FLIGHT MEANS SPEED. Speed requires power of engine and angle of dive. When in doubt, give her the gun and nose her down. A slow plane means a slow refrain. If you're fast—you'll last.

18. COMMUNICATE FORCED LANDING IMMEDIATELY. If you are still among these "Present on Earth" 'phone in the extent of the damage and whether the "bus" can be flown again or not.

19. FLYING MEANS "PEP." If you haven't got it—you can't put it into your "bus". The credit for winning this war will be given to the "Birds" who are dropping "Eggs" on "Heinie," and not dropping *themselves* when their country needs them most.

20. CARRY NO PASSENGERS WITHOUT PERMISSION. The Government isn't running a "joy-line." The "All-seeing-eye" knows that a flyer is just naturally a "Nut" and that a passenger unduly excites him to do things. And when a pilot "Does things" the engine has a nasty way of mussing up the front seat.

Heath Plane Fits into Garage

Fig. 3

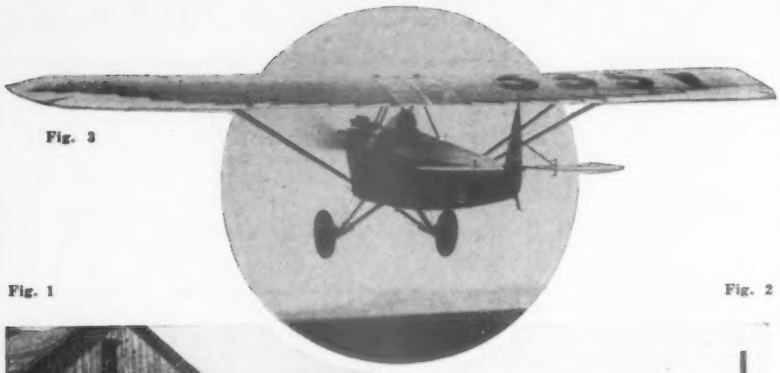
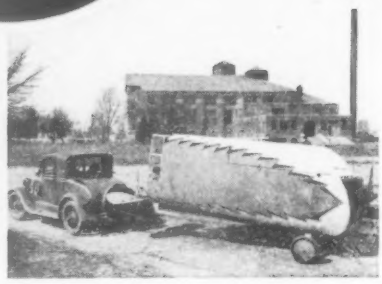


Fig. 1

Fig. 2



A Heath owner is shown taking her plane out of the garage, towing it to the airport, and flying it after the assembly.

IF YOU could keep an airplane in your own back yard when you weren't flying it you might own one, mightn't you? Well, that can now be done with the new model Heath Parasol. A small garage or shed big enough to get a small automobile in will easily house this handy airplane. No longer is it necessary to spend a lot of money for hangar space or to take a chance of keeping it out in the open where any number of things might happen to it.

Here is an airplane that you can keep at home and on Saturday afternoon or Sunday take it out to a nearby field, take off, fly around and bring it home with you in the evening.

In the accompanying photographs you can see how easily it is done. Fig. 1 shows a young woman getting her plane out of her back yard shed. You can see by the way she is holding her plane up and dragging it out that it is certainly very easy to handle. In Fig. 2 the plane is hooked up behind her Ford. With the plane attached to the car in this way it will ride along just as steady as an ordinary trailer behind an automobile. Fig. 3 shows the same plane in flight after a quick assembly at the field.

The special arrangment of detachable wings on this new Heath Parasol makes it possible to easily and quickly unbolt the wing from its regular position and place it alongside the fuselage. It must be remembered that this is not a folding wing, but a detachable wing. The wing is, of course, in 2 sections and when the owner desires to mount the wing alongside the fuselage, all he has to do is to unfasten the wing by taking out the center wing bolts and disconnect the V-shaped wing spars from the fuselage. There are 2 special brackets, one near the cockpit and one near the tail, on which the wing is mounted. One wing-panel is then placed on one side of the fuselage on these brackets and the other half on the other side. These brackets can be seen in Figs. 1 and 2 where they are seen holding the wings in place.

There is a special brace or cable sling which holds the 2 parts of the wing in place when they are alongside the fuselage and also a lock to hold the ailerons rigid. In this form the whole plane is a very compact unit and will not jostle or bounce around when being towed to or from the airport. With this new feature introduced on such a light, inexpensive plane, the problems and expense of housing facilities are now greatly reduced.

A Flying Gun

DESIGNED to hit targets 100 miles away, an aerial torpedo is said to have been made ready for manufacture just before the close of the World War. Details of the mechanism are being held secret.

New Motorless Airplane

A NEW type of motorless airplane is under construction in Berlin. It is intended to imitate as closely as possible the structure and soaring action of large birds, such as the Albatross. It has joints in its wings.

"Air Pockets" Do Not Exist

THERE is no such thing as an air pocket. What the average passenger thinks is an air pocket is only the conjunction of two currents of air through which the plane is passing. If one could see the air as water, it would seem to have falls, whirlpools and rapids just as a swift river does, although the air river is much broader than any river one could imagine.

As the plane passes through a vertical air current, one with an upward trend, it is raised at a rapid rate, but due to the wing spread acting as a brake or stopper, the airplane suddenly stops its rise. The passenger not having any wings to stop his upward trend will naturally rise in the seat, which leads one to think the plane has dropped from under him, when in reality he has only raised a fraction of an inch higher than the plane itself. This gives one the sensation of lightness and leads him to believe he has struck a so called air pocket.

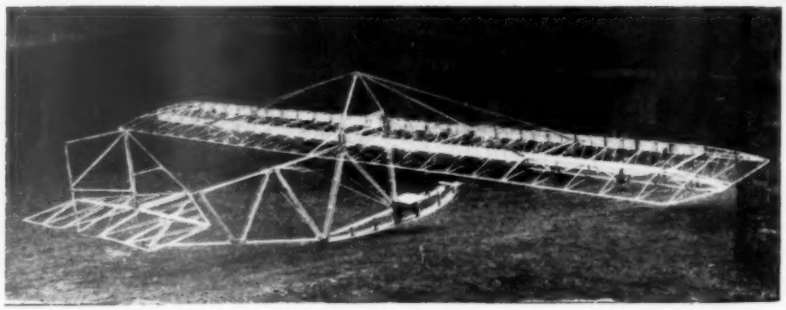
Daredevil Hangs by Leg from Plane

PHILLIP (Jersey) RINGEL thinks nothing at all of turning hand springs—standing on his head or doing any other daredevil stunt on a plane in motion. Spectators feel thrills of horror up and down their spines while the New Jersey fellow dangles in the air but the stunt artist doesn't turn a hair.

We hope the old Jenny supporting his rope ladder doesn't start acting up before the air-devil crawls back into the cockpit.

An aerial performer was doing this stunt in Germany a few weeks ago when he got tangled up in his ladder and could not get back into the plane. The pilot was unable to extricate him. He swooped low over the field several times so that men on the ground could make an effort to release the aerobat, but to no avail. When the pilot was forced to land the dangling performer was dragged over the ground and mortally injured.

The skeleton shown below gives you an idea of the Rhon Ranger as it appears when ready to cover. Note the graceful symmetry of its proportions, the perfect balance as it stands unsupported, and the scientific design which gives maximum strength with minimum weight. The skeleton shown weighs only 105 pounds complete.



Due to its remarkably flat gliding angle, the Rhon Ranger floats to a landing like a feather. There is no bump or shock, no tilting up on the nose, just a graceful drift to the ground, and the flight is over.

Above you see the glider just before it touches the ground.

How to Build the Rhön Ranger

Part I---Building the Ribs

It's Easy to Build a Rhon Ranger

and you will learn valuable lessons in the fundamentals of aircraft construction.

THE tools required to build the Rhon Ranger are few, and consist mainly of ordinary shop tools such as can be found in the average household.

You don't have to be a skilled mechanic or an aircraft engineer to build a Rhon Ranger. The blueprints are clear and thorough, and the instructions tell you the best and shortest way to put each part in its proper place.

Glider builders frequently find that it proves costly to collect the necessary material, and prefer to buy a Complete Construction Kit. For further information, refer to the advertisement on page 82.

The Ribs

CAUTION: Always remember that when the instructions say "nail", it means nail after spreading glue on both pieces to be joined. The nails hold the parts in place until the glue sets.

FOR the Rib Jig, select a good pine board about 1"x12"x5'-6" and lay the full size rib pattern on it, putting thumbtacks in the corners to hold it flat. With a nail make dents in the board at all the corners where the cross-members (H-17) meet the capstrips (H-2). Also make enough dents on both sides of the capstrips so that they cannot get away from the proper curve when they are held in the jig. The nails at the front of the rib should be fairly close together. Eight-penny finishing nails should be driven in at the points marked and the heads clipped off so that they project about ½" from the board. File the tops smooth so you won't scratch your hands.

Cut three pieces one inch long from a capstrip and nail two of them in the positions of the leading edge and the trailing edge; nail the third piece at the front of the rib as a stop for the bottom capstrip.

On another heavy board drive several twenty-penny spikes in such a way as to hold the capstrips in their proper curve, for about one foot starting at the front. The nails should stand high enough to hold six or eight strips at once.

Select the ends of the capstrips which have the straightest grain, and soak them in water a foot deep for two hours. Then put the wet ends in the drying rack just described and allow them to dry. The strips measure ¼" one way and about 7/32" the other way; set them in the rack so that they are bent the thin way.

When the strips have dried in the rack, take them out and start on the ribs, putting more strips in the rack to dry while you work.

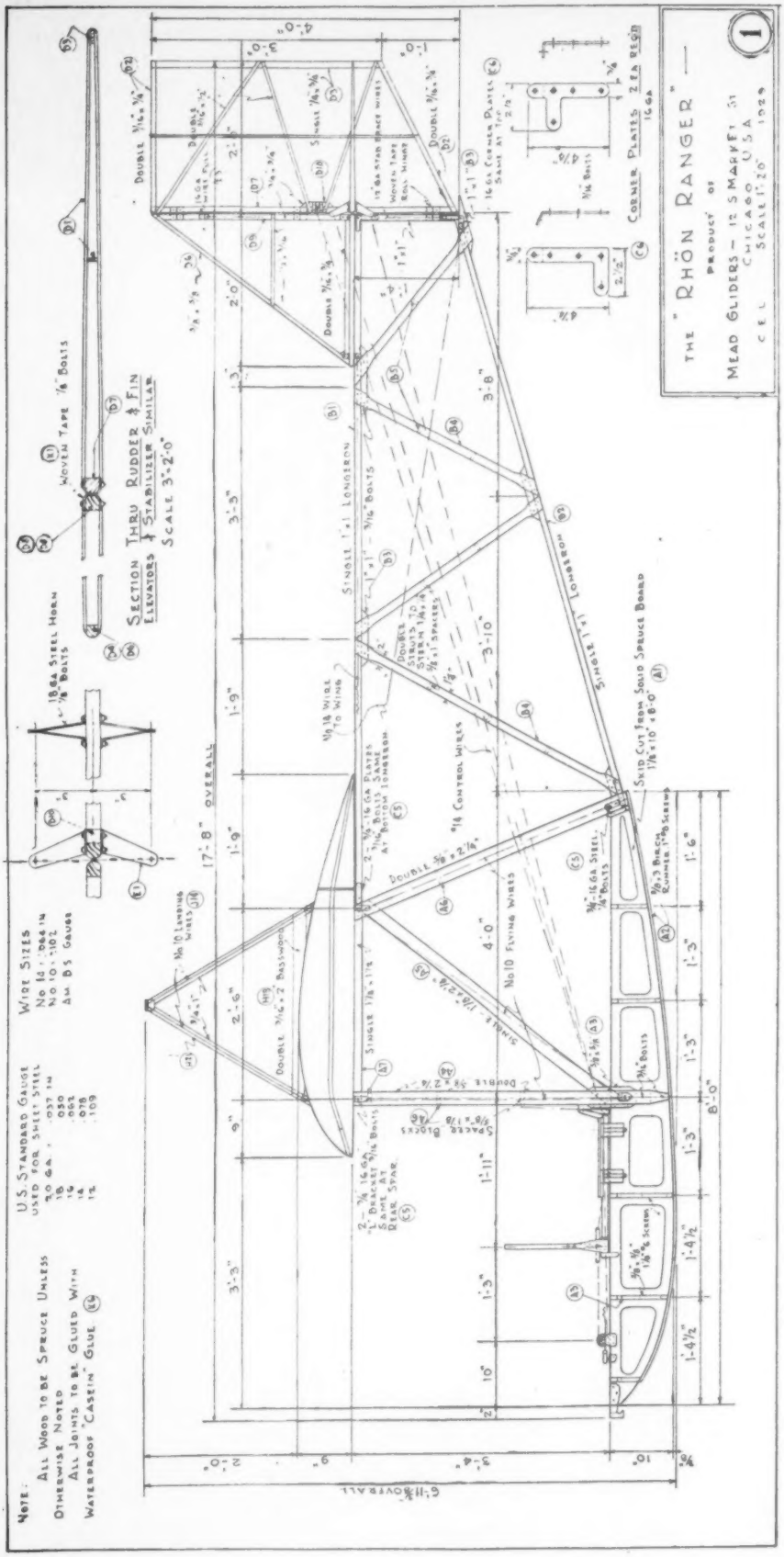
Place the top capstrip in the jig and cut off the end to fit against the leading edge block; do the same at the trailing edge. Place the lower strip tight against the stop block, and cut off the tail flush with the end of the top strip. Fit the two cut-offs between the capstrips to form the spar nailing strips. Break off pieces of the rib-struts (H-17) allowing a projection of half an inch or so to prevent splitting at the ends. Note that there is a rib-strut on each side of both spar nailing strips. All joints must be well glued, including the entire length of the spar nailing strips. Use ½" No. 20 nails (J-24) on all joints except where the short horizontal spar-supports occur; use 5/8" No. 20 nail here. Note that some rib-struts go underneath the capstrips and others on top. It is best to nail all the top pieces on first, then pry up the capstrips gently with a chisel, slip the other struts through, glue, and nail in place. At the spar nailing strips you will have to glue all three pieces, set them in place, and nail them all together.

When all parts are securely nailed, pry the rib carefully out of the jig, and clinch the nails on the under side, using a small block of iron as an anvil to keep the nails from backing out. Bend the nails over so that they don't project outside of the capstrips, as you will have to cut off the ends of the struts with a coping saw after the glue is dry.

The first rib may take two hours, but after one or two more you will turn them out in forty minutes or less.

The following parts are necessary for the construction of Wings, Ailerons, and Cabane.

Part No.	*Wood Material*
H1	4 pcs. spruce ½"x4"x14'-0" (spars)
H2	60 pcs. spruce ¼"x¼"x6'-0" (capstrips) (spar nailing strips, extra aileron rib, etc.)
H3	8 pcs. spruce ½"x½"x2'-6" (spar extension pieces)
H4	4 pcs. spruce ½"x½"x8'-0" (aileron spars)
H5	2 pcs. spruce 5/8"x5/8"x3'-0" (wing tips)
H6	4 pcs. spruce ¼"x½"x6'-0" (extra capstrips at center ribs)
H7	10 pcs. spruce 3/8"x3/8"x2'-6" (internal compression struts)
H8	50 ft. random lengths spruce



5/16" x 5/16" (diagonal braces)

H9 2 pcs. spruce ¼"x¾"x 9'-6" (trailing edge)

H10 4pcs. spruce ¼"x¾"x6'-8" (trailing edge at aileron gap)

H11 2pcs. spruce ¼"x¾"x6'-0" (aileron trailing edges)

H12 4 pcs. spruce ¼"x¾"x 8'-0" (leading edge)

H13 1 pc. spruce ¼"x¾"x6'-0" (aileron side & front wing corners)

H14 1 pc. spruce ¼"x¾"x5'-0" (nailing strips at spar root)

H15 1 pc. spruce ½"x1-½"x 4'-6" (spar filler blocks at wing root, aileron pulley brackets, wing-wire anchors, etc.)

H16 1 pc. spruce or pine 3/8"x3/8"x2'-0" (triangular nailing blocks for top capstrips at nose)

H17 320 LF 3/32"x½" basswood (rib struts and aileron spars)

H18 31 LF ¼" x2" basswood (nose ribs & cabane bottom member)

H19 1 pc. basswood ¼"x6"x 12" (aileron rib fillers at horns)

H20 8 pcs. spruce ¼"x½"x 2'-0" (diagonals at aileron horn)

H21 1 pc. spruce ¾"x1"x5'-0" (cabane frame)

Hardware

J1 25½ ft. ¾"x16 gauge strip steel (wing wire anchorage, cabane brackets, ailerons hinge braces and rear fuselage brace)

J2 1 pc. sheet steel 1-½"x9" 16 ga. (top cabane fittings)

J3 1 pc. sheet steel 2"x22" 18 ga. (ailerons pulley brackets and spring anchors on wing)

J4 1 pc. strip steel 5/8"x18" 18 ga. (aileron pulley sheaves)

J5 1 pc. strip steel 2"x4'-0" 18 ga. (aileron horns)

J6 1 pc. strip steel 5/8"x 3'-6" 18 ga. (internal wire fittings and two aileron turnbuckles)

J7 1 pc. strip steel ¾"x6'-8" 18 ga. (for 10 flying & landing wire turnbuckles)

J8 2 aluminum pulleys

J9 2 coil springs(aileron balance)

J10 9' flexible aircraft cable (aileron cable over pulley to horn)

J11 4 cable thimbles for J10

J12 126 ft. no. 14 plated hard wire (internal wing bracing)

XUM

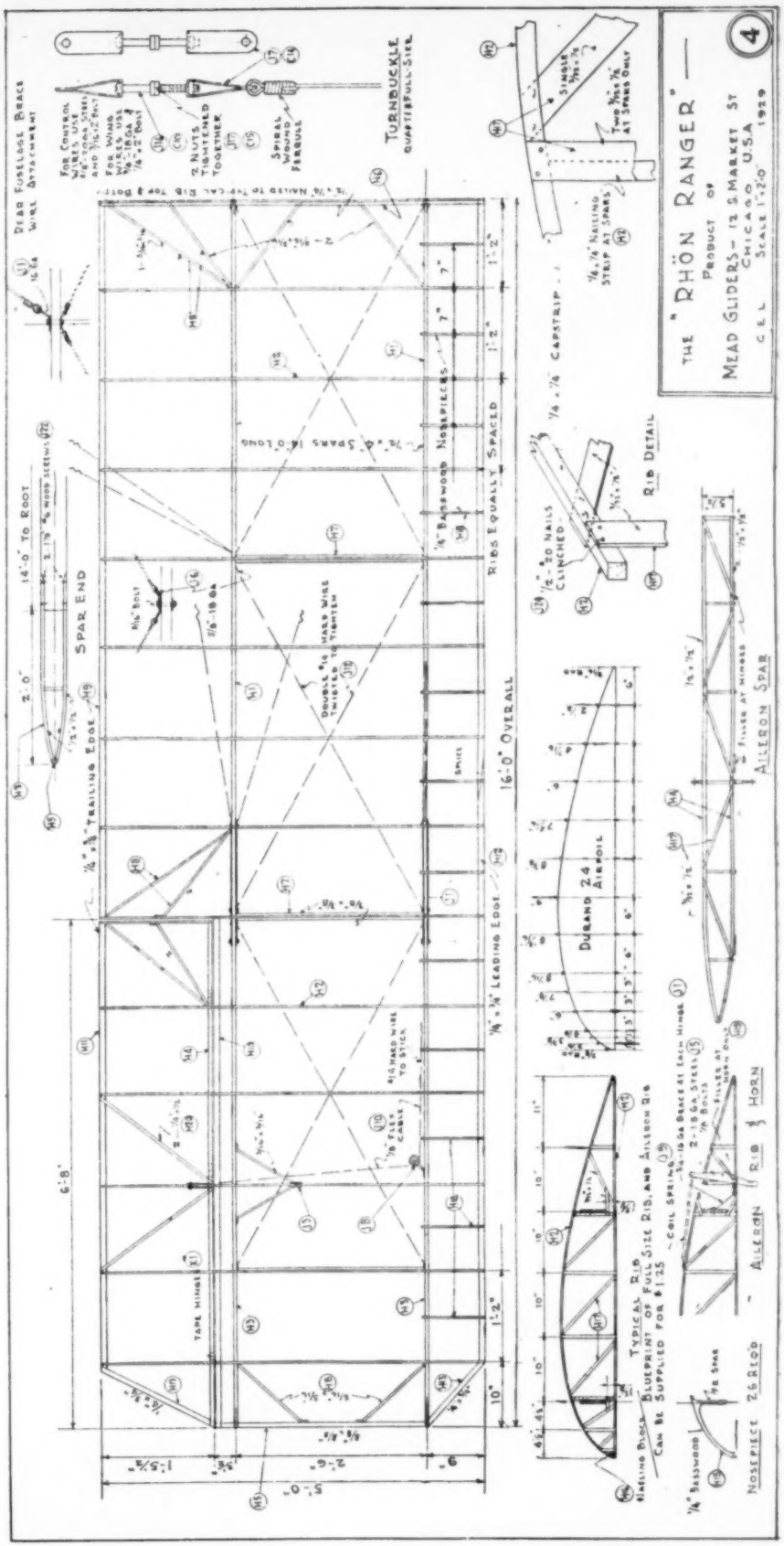
J13 12 No. 14 spiral wound ferrules
J14 100 ft. No. 10 plated hard wire (flying & landing wires)
J15 20 No. 10 spiral wound ferrules
J16 10 ¼"x 2" bolts (turnbuckles for flying & landing wires)
J17 20 extra ¼" nuts for J16
J18 30 1/8"x1" bolts (aileron hinges and braces)
J19 48 3/16"x1-¼" bolts (fin brackets, flying wire fittings, aileron pulley & bracket, aileron horn, & internal wire fittings)
J20 4 ¼"x1-¼" machine screws & nuts (main flying wire anchors)
J21 20 ¼"x¾" bolts (wire terminals)
J22 16 1-¼" No. 6 FH wood screws (spar extension members)
J23 4 ¼"x8" threaded rods and 8 nuts (wing root hold down bolts)
J24 ½ lb. ½" No. 20 wire nails (ribs, etc.)
J25 ¼ lb. ¾" No. 19 wire nails (nailing ribs to spars etc.)
J26 6 oz. 1" No. 20 wire nails (rib noses & tails, nose ribs etc.)
J27 1 lb. casein glue

The next two articles will complete the series and will give complete plans, list of materials, and directions on Building the Fuselage, Tail Unit, the Wing, etc., until the job is finished.

By special arrangement, POPULAR AVIATION can supply its readers with full scale blueprints and complete instructions for building of the Rhon Ranger *and* a one-year subscription to POPULAR AVIATION for $3.75 (regularly $5.25).

Specifications and Dimensions

Length overall	17 ft. 8 in.
Height overall	6 ft. 11 in.
Span	32 ft.
Cord	5 ft.
Aspect ratio	6.4 to 1
Areas:	
Wing, (incl. ailerons)	160 sq. ft.
Ailerons	18 sq. ft.
Rudder	7 sq. ft.
Fin	2.7 sq. ft.
Stabilizer	8.33 sq. ft.
Elevators	14 sq. ft.
Weights:	
Fuselage and controls	52 lbs.
Cabane	2 lbs.
Wings panels, each	32 lbs.
Total weight empty	118 lbs.
Wing loading (160 lb. pilot)	1.73 lbs. per sq. ft. (This glider has successfully carried two men, combined weight 285 lbs.)
Performance:	
Gliding angle	18 to 1
Landing speed	8 to 12 MPH



Capt. Davidson is shown clearing the treetops after having leaped from the ground.

Balloon Jumping Is Popular Sport

BALLOON jumping, now becoming so popular in England and followed to a limited extent in this country, is an interesting variation on the old time captive balloon. As suggested by its name, "balloon-jumping" consists of short hops or flights with a small spherical balloon having only a slight excess of lifting capacity over the weight of the passenger or "pilot." With the lift greater than the weight, the natural tendency of the balloon is to climb and under these conditions the balloon is generally controlled by a rope or anchor line that limits the height of ascent. In the actual "jumping" the lift is slightly reduced below the weight of the pilot by the use of ballast so that only a slight effort at leaping will send the balloon over the tree tops. His weight then brings the bag back to earth.

This is very clearly illustrated by the accompanying photographs that show a jumping balloon demonstration by Capt. Davidson at the Ranlagh Polo grounds in England. Capt. Davidson is suspended beneath the balloon by a harness similar to that used by a parachute jumper and no basket is provided. The basket would add unnecessary weight and would call for a considerably larger envelope, and as it is not essential it has been omitted. Catlines running to the girth-ring toggles are connected to the harness directly without the added complication of the usual netting. This construction also adds to the safety of the balloon as the girth ring will convert the balloon into a parachute in case the gas is lost.

As with all small spherical balloons, the envelope is built up on the "gore" system with vertical seams, a construction that is much less expensive than the staggered patch envelopes employed on large sphericals. Depending upon the weight of the pilot and the kind of gas used, the capacity of the bag will range from 3,500 to 4,500 cubic feet with a diameter of approximately 20 feet. As the lifting power of illuminating gas is only two-thirds that of hydrogen, it is necessary that this capacity and diameter must be somewhat increased with illuminating gas, but sometimes this is the better arrangement as illuminating gas is much cheaper and more easily available.

The controls are very simple, especially when used as a captive balloon. A small maneuver valve at the top of the envelope is for deflation or descent, while a small bag of sand ballast compensates for the loss of gas by leakage when the sand is thrown overboard. Generally the pilot can handle this alone, but at the most, one extra man may be needed under special conditions.

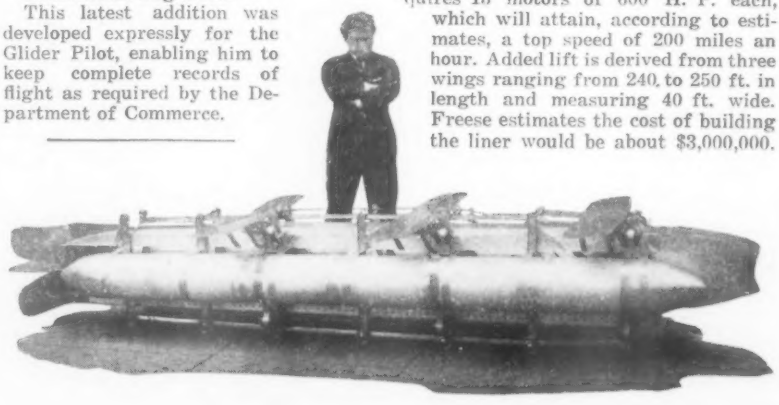
Air Pilot Drops 'Funnies'

EARLY Sunday mornings at the Portland Airport always finds Al Davis, Varney Air Lines pilot, scurrying around the hangars looking for fresh funny sheets. Soon he takes off with the morning load of transcontinental mail and an hour and a half later finds him roaring over the sage brush territory of central Washington. Down on the sand dunes with upturned eyes a group of youngsters awaits the distant drone with eagerness. A moment later Davis swoops down close to the ground, drops a tightly rolled packet of funnies, dips his plane gracefully on one wing, waves a greeting to the little group below and is lost to sight in a few moments behind the rolling hills. Davis says the last look back reveals a mad scramble for the papers. He says he gets a real thrill out of the weekly aerial paper boy stunt.

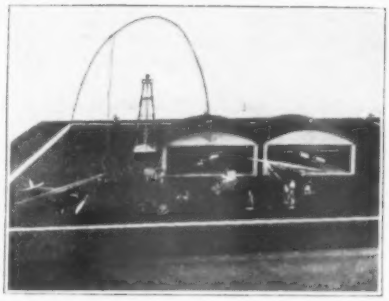
New Glider Pilot Log Book

THE Johnson Airplane and Supply Company have added to their line of Log Books a new book entitled the "Glider Pilot Log Book."

This latest addition was developed expressly for the Glider Pilot, enabling him to keep complete records of flight as required by the Department of Commerce.



Toy Plane Flies by Electricity



A COMMERCIAL toy concern is manufacturing electrically operated miniature aeroplanes that actually fly.

These little toy planes are connected with the hangar, by a steel spring rod. When the current is turned on, the plane takes off and circles the hangar and when the current is shut off makes a graceful three point landing. The plane and hangar sell for $15.50.

The plane requires approximately fourteen volts to start and is then operated on eight volts. Current is supplied through a toy transformer, the spring rod acting as one side of the circuit and a wire running down the rod carries the other side to the tip of the wings.

The revolving beacon and the field marker lights are additional equipment with which to lay out a complete airport.

The revolving beacon is a very interesting toy, employing as it does a new principle, the light is made to revolve through utilization of the alternating current pulsations.

Vehicle to Carry 500 Passengers at 200 M. P. H.

FLIGHT from here to Europe in sixty hours aboard a leviathan of the air carrying 500 passengers, is the goal toward which the Los Angeles inventor, Claude H. Freese is striving. The triplane dirigible airship built of duralumin, calls for a gas capacity of 6,000,000 cubic ft. of helium distributed among forty separate chambers. It requires 13 motors of 600 H. P. each, which will attain, according to estimates, a top speed of 200 miles an hour. Added lift is derived from three wings ranging from 240 to 250 ft. in length and measuring 40 ft. wide. Freese estimates the cost of building the liner would be about $3,000,000.

Flying Billboards

Most of us have seen advertising notices in the air during baseball games. This article tells some of the tricks of getting these signs into the air by the use of kites and balloons.

By Walter J. Holmes

WHIRR-R! The stout waxed cord in your hand jerks taut, you let her out. The big Australian box kites soars skyward. The cord races through your leather faced gloves till they burn. You loop the cord around your hand and she climbs again.

That is a part of the business of commercial kite flying. Heretofore it has been a junior sport, of a part of the mysterious rites of the U. S. Weather Bureau. Now it is a new medium of advertising.

The kites I fly lift a sign 120 feet long with letters nine feet high. They are cut out of silk fabric, sewed to a network of linen cord and hung from a stout rope.

It takes from two to six kites to raise the banner up in the air. If the breeze is light we have to use more. The kites are snapped to a steel ring at the back of the sign and we are ready to go.

A complete outfit weighs about seventy-five pounds and costs one thousand dollars. The operating cost, including the salaries of two men, traveling expenses and materials for repairs is about one hundred and fifty dollars a week for the advertiser.

The banner I fly is used to advertise a brand of candy, but sky signs have also been used to advertise gasoline, cigarettes, automobiles and other products.

There are tricks to kite flying just as there are with other trades. The hardest one is to get five kites in the air at one time and then hook them on the banner. When this is done and the banner leaves the roof the rest is fairly simple.

Each operator has an assistant and a more or less secret belief that the latter is a fat-headed ass. The same feeling is held by the assistant for the operator. This is partly due to the nervous nature of the work and the fact that so much can happen in a few seconds if the wind dies.

To begin with, my helper and I each raise a kite. Somehow his line gets tangled and he takes his glance from his kite for a moment while he swears and works at a knot that has formed in his line while his back was turned. The wind slacks off and his kite starts to fall.

"Watch your kite," I yell at the top of my voice.

"Give me a chance. I'm not blind," he retorts as he runs backward along the roof to within six inches of an open court and a fall of ten stories.

The kite hesitates a moment as though trying to decide whether to nest in the trees of the court house square or on a trolly wire. Then it takes the wind and shoots up to safety.

We tie our kites to convenient pipes and launch more kites. When they are hooked to the steel ring at the forward end of the banner they spread out fan shaped instead of bunching up as one might imagine. Each cord is a different length so that it is almost impossible for them to collide in the air.

When one length of rope is let out we usually raise another kite to take care of any sagging on the line and keep the sign horizontal. Ordinarily the banner goes skyward at a forty-five degree angle and the sign hangs one or two blocks away from the anchoring place.

We have two sizes of rope, 3-16 and ¼ inch, which are tested to withstand a pull of 550 and 700 pounds. As the kites are built to utilize all the available wind there is a terrific pull on them at times. I have seen two kites drag a man across a roof and to the low wall that surrounds it. Invariably he yells bloody murder all the way. I know because I've been the man.

Sometimes the wind is strong enough to break the main line rope. It happened to me once. A good stiff breeze was blowing and the rope was taut and stiff as a board. Suddenly a shiver ran along the rope. Then it fell and the sign leaped in the air. With the release of pull on the line the kites lost the angle which forces them into the wind. They floated slowly downward. The sign grazed a box factory and caught on a telegraph wire.

Now the kites had something to anchor them and they bucked into the wind again, all save one that hit the ground and was taken before we arrived on the scene which was half a mile from where it had broken loose. The sign was ripped so that it looked like a hopeless wreck and some young men had taken charge of the outfit with the intention of bringing it to the ground as a souvenir. As they were afraid to climb the telegraph pole and reach out along the wires they had adopted a policy of watchful waiting.

There was more or less talk of an unpleasant nature when we got there and took over the outfit, but unpleasant words are not infrequent in the business of recovering lost kites.

When kites are returned voluntarily we pay a reward. If the finder tries to keep them—well, our instructions from the office are simply to "get them back." I knew one kite flier who chased a fellow three blocks up an alley and then had to fight for his kite.

Occasionally we have visitors at the roof but for our convenience, the company's orders and their own safety, they are requested to leave. Most of them trip over ropes and ask you to give or sell them a kite. Quite a number of people look them over with an idea of making kites of their own. Why, I don't know. Perhaps I lack the sporting disposition to appreciate a craving for kites.

The ordinary visitor asks if you leave them up all night (If keeping them up were only that simple). Then he tests the pull of the rope and spec-

The author is shown adjusting his kite. At the right, a kite is being released, soon to be followed by its trailer, an advertising notice.

ulates on the fate of a man who would hang on to the rope and sail away, or how far a tight rope walker could go on the line. If he has not been requested to leave by this time he may see how far he can lean over the edge of the roof, comment on the fact that it makes him dizzy, and then see if he can hit anyone on the street below with gravel from the roof.

Most of the time we work undisturbed and alone. Far below is the rumble and grind of the city, but here we are as solitary as Crusoe and Friday. On the sidewalk the busy business men and shoppers are rushing to their work. One of them happens to look up. The red and black banner is standing out sharply against the blue and white of the morning sky. The sun gleams

This advertising sign is being flown from kites, and is anchored to the roof of a building

on the rippling silk of kites that are pushing their way into the wind like a flock of great birds. One dives toward the earth at fifty miles an hour. It reaches the end of its cord and begins a pendulum-like rise. The watchers below are never sure it will do this so they stand fascinated. Other passersby see people with their necks craned and they too stop to stare.

We stay in a town only long enough to get a few good flights and then are off for new locations. Of course in a big city we stay longer but even there we try to change to different neighborhoods.

Getting locations is another interesting job. As the company does not pay for the privilege of flying from roofs we frequently find objections to letting us have their use. One man will say that if he allowed us to use the roof everyone would want to use it. Presumably he visions hordes of kite men clamoring to fly there, once the precedent is established.

Another man will offer to let you use his roof for one hundred dollars a day and still another will consent if you will make a banner to advertise his business and fly it with yours. The former plan would be cheaper for us. However, as a whole, building superintendents are willing to let us fly if we assume all responsibility.

As an advertising medium the sky sign has the advantage of being unique. It attracts attention as no other form could. On clear days it can be read for a mile and one quarter.

Against that is the fact that it can be flown only when there is a breeze of eleven miles per hour or more and as the advertising salesman would say, "It doesn't get into the home," though it may land on the roof.

My flight that won the most publicity was at Cub's Park in Chicago. There was an exceptionally light breeze that day and the outfit stayed in the air only by constant maneuvering. The roof from which it was flown faced the park so that it was impossible to let it out to a safe height and still have it visible from the seats in the park. In other words, if we let out two blocks of rope the sign would hang one block the other side of the park.

On one occasion the kites dove so low that the players had to duck to avoid being struck. Philadelphia, I believe, was at bat and the shadow of the sign fell on the pitcher so that the man could not see how or when the pitcher was going to throw. He refused to play. The umpire motioned us to pull in the kites, which we did after some delay. The result was that the radio announcer broadcasted the situation and the press commented on it.

Another kite flier had a banner over a race track when the wind failed him and the sign came down across the track while the horses were running. Quick work on the part of the police kept the fliers from being mobbed by those who had money on the race.

At an election in Detroit a short time ago balloons were used by a certain candidate as a part of his advertising. Some of the members of the opposite party, remembering the good old days in sunny France, took rifles and proceeded to snipe them. In his dark hour the candidate remembered that kites were harder to hit and almost impossible to bring down with rifle bullets. Whereupon he used kites to bring his name before the public.

The outfit we used was designed by Mr. E. G. Finlay, an Australian and owner of the Aerial Advertising Company of America with offices in San Francisco. His first efforts at aerial advertising were with balloons but he changed to kites as they were more spectacular and could carry a larger sign.

Balloons have the cost of gas in operating but they are at their best on a still day when kites would not leave the ground. On a windy day though, a balloon becomes unmanageable while kites do their best. It's a case of the kite flier's soup being the balloonists poison.

New Automatic Device for Airplanes

In a dive the slots will project forward and upward at a 25 degree angle.

JEAN FRANCIS DE VILLARD, airplane designer has suggested a Fool Proof Safety Devise to prevent a tail spin, nose dive, nose over, or side slip. According to the inventor, his device will allow a low flying speed of 25 miles per hour, and will land a plane at 20 miles per hour.

De Villard has recently completed two models, one a 42 inch, and the other an 8 ft. both being equipped with the De Villard Device, the 42 inch model was tested through a wind tunnel and gave the inventor the results mentioned in his claims.

In 60 days a high powered monoplane and biplane will be equipped with the De Villard Device for a demonstration to the aviation world and to be turned over to the Material Division of the War Department to be tested.

The feature of the invention is a slot which extends along the leading edge. When automatically opened the slot is approximately four inches above the wing surface and projects 15 to 24 inches forward from leading edge. In a dive the slots will project forward and upward at a 25 degree angle.

The second feature of the De Villard device is a Bifold Flap, some may call it a Split Flap, along the trailing edge, the upper flap operates independently of the lower. In a stall the slot is forced out, the lower flap automatically opens downward. In a nose dive the slot is opened and the front part of slot projects upwards 25 degrees and the upper flap opens automatically.

Both flaps can be opened at the same time. With both flaps open a vertical landing can be made, in the mean time the slots must be opened, this is done with a lever independent of the automatic controls. No nose over is possible, the double brake by opening the flaps lower and upper should stop the plane within twenty-five feet.

The third feature is the Fin attached to the ailerons. The fin offers no resistance and serves as a stabilizer at all times. In a side slip the fin maintains the pressure and momentum of the machine against the wind and causes it to be righted.

Upper and lower Biford flaps opened. In a stall, the slot is forced out, the lower flap automatically opens downward.

XUM

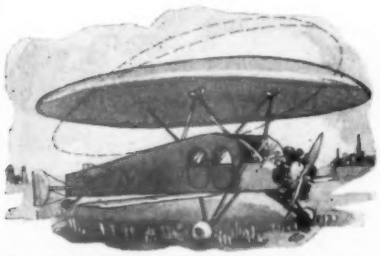
New York to Paris in 15 Hours

IT IS not at all unlikely that before another year has elapsed some aviator will have flown from New York to Paris in 15 hours. Such a plan, which is now being formulated by plane manufacturers and flight experts, calls for the use of a powerful supercharged engine in a plane that will attain a speed of 200 miles an hour at an altitude of 20,000 feet. Weather bureau data further show that the velocity of the wind at an elevation of almost four miles would give an additional minimum speed of about 50 miles an hour, or a total speed of approximately 250 miles an hour. The 3,600-mile flight could thus be made in about 15 hours, or, with a higher tail wind, in possibly 12 hours.

The plane used on such a flight could be an ordinary high-speed monoplane equipped with a special supercharged engine, oxygen tanks, and instruments for transoceanic navigation. In addition, the cabin of the plane would have to be heated and insulated against the cold encountered at the high altitudes. The propeller would have to be designed for high efficiency at an elevation of 4 to 5 miles. The plane would not be able to leave the ground with the necessary fuel load, and provision would therefore have to be made for refueling in the higher regions; as a matter of fact, two or three fueling planes might be required to fuel the transoceanic plane with dispatch.

Following the great circle route, the plane would refuel in the air again when over Newfoundland before starting on the flight across the Atlantic. whether or not another re-fueling would be necessary over England or Ireland would depend upon the velocity of the tail winds.

Novel Plane with Circular Wing



S. P. NEMETH, of Chicago, has designed a circular wing monoplane, the wing of which is pivoted. This permits the pilot to adjust the angle of incidence in flight.

Mr. Nemeth claims that a disc only 23 feet in diameter provides the same lifting surface as the 100 foot wing spread on the new 32-passenger Fokkers.

The adjustable circular wing allows the plane to climb rapidly and maintain a 35 m. p. h. landing speed, and a similar speed at level flight, and yet permits a top speed of 120 m. p. h.

The True Story of the Man Who Flew Through Shrapnel

Capt. Jack C. Bursey, author of "How We Shot Down Immelmann," by strange coincidence was the pilot of this plane which was known to have come through shrapnel fire. He tells us about that memorable flight in the following letter:

IN THE June issue of your magazine, POPULAR AVIATION, there is an illustrated article dealing with a Nieuport scout that was hit by shell fire, and landed safely. Your readers will probably be interested to know that the writer was at the controls when this particular ship was hit. The details follow:

I was on patrol with five other planes at an average altitude of 14,000 feet, and we had been on the enemy side of no man's land only a short time when we were subjected to a very heavy shell fire from enemy anti-aircraft guns.

Each and every pilot had his own pet method of dodging this fire—mine was to drop down a thousand feet in a side slip, make a few turns to the right and left, climb five hundred feet, and then laugh at the trouble that the enemy gunners must be having trying to change the elevation of their guns. As soon as the shell fire started, I commenced my twisting and turning, and it is worth while mentioning that I noticed at the time that the shells were exploding much closer to us than they usually did. However, I forgot it at once, because I had the dual job of evading the shells, and keeping one eye open for any possible attack from above or below by enemy planes.

After a few minutes dodging, I put the nose of my ship down into a power dive, and was looking out over the right hand side of the fuselage, when I heard and felt a large sized explosion pretty close to me. I saw the black smoke—flew through it in fact, and you can imagine my consternation when I saw that the shell had burst close enough to me to have completely broken the main spar in the lower left hand wing on my ship, and my eyes nearly popped out when I saw the wing buckling in the center!

The first thing that I did was to throttle my motor down to as low a speed as I could get it, and I started that long glide back in the direction of my home field. I did not have the slightest idea of making the field, but I wanted to be sure that if I crashed, I would be buried on my own side of the lines.

I watched the wing very carefully all the way down, and it withstood the tremendous strain put upon it in great style. Gradually I could see the earth getting closer and closer, and I began to pray that the old wing would hold together for just five more minutes! Then I hit upon the idea of landing right on my own field—and I headed in that direction. But I want to tell you that back in my mind was the ever present picture of a smashed up Nieuport with myself being mopped up out of the wreckage with a vacuum cleaner!

But the field got closer and closer, and finally I straightened out for the easy glide to earth. I switched my motor off at the ignition so that the wreck wouldn't catch fire, because I was confident that there would be a grand and glorious crash.

The earth came up to meet me—and I started to flatten out when I was about ten feet from the ground, and still nothing happened. All of the time I had my right wing low, to aid the crippled wing, and when I finally tried to pull the wings level just before the ship reached the ground, the controls wouldn't respond, and I landed on the right hand wing tip, the plane stood on it's nose for a second, and then settled back with the landing gear badly damaged, the wing tip gone on one side, and the entire wing ruined on the opposite side. The only thing that saved my life was the fact that the lump of shrapnel that hit the spar did not hit any of the control wires. If that little thing had happened, it would have been a case of that long plunge where all of your misdeeds pass before your mind in rapid succession.

I hope that your readers will be interested in reading this little account of how the ship was brought back to earth.

Army Bomber Flies by Itself

THE feasibility of waging war in the air without the use of human pilots and of sending huge planes, piloted only by machinery, on cross-country trips, has been demonstrated by the army air corps.

A big army bomber took off from Mather Field, Sacramento, on April 17, bearing four men and a queer looking machine the size of a hat box. When the plane was well in the air the pilot Major Hugh Knerr, turned the controls over to the little machine, which flew the ship straight as an arrow to San Francisco.

Over the Bay, Knerr touched a button and the machine guided the 18,000 pound plane in circles for 20 minutes and then headed it back for Sacramento. Except for the take off and landing, the machine did all the navigating, keeping the plane on an even keel through the rough air and maintaining its course with mechanical precision.

When Knerr left the control of the plane to the automatic pilot he retired to a rear cockpit of the ship, and except for going forward to press the buttons for turns, remained away from the instrument.

Well Known Sport-Plane Available in New Model

The Irwin Meteorplane F-A-1 is used as a mail plane in Iceland.

THE latest model of the Irwin Aircraft Co. is called the Irwin Meteorplane F-A-1 (Fly About) and sells for $1165.

It is a one place open job powered with an Irwin 20 H. P. engine (4 cylinders air cooled) which uses but 1½ gallons of fuel per hour. The manufacturers state that it can be operated at an expense of less than 50c per hour.

The F-A-1 has a top speed of 85 m. p. h., cruising range of 250 miles, cruising speed 75 m. p. h., and a landing speed of 26 m. p. h. It will take off with a run of about 80 ft. and in landing will come to rest within 100 ft. without the use of brakes.

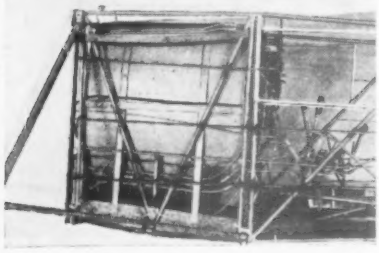
It is interesting to know that one of these planes is used commercially in Iceland to carry mail. Although the pay load is only 75 lbs., the average mail load carried is about 30 or 35 lbs., which amounts to about $50 per trip.

New Kind of Gasoline

A NEW non-inflammable gasoline, known as "white spirit," has been developed in France for airplane engines. Tests have shown that the substance will not catch on fire.

A Gas Tank for Trans-Atlantic Flying

FROM thirty to forty hours of steady flying time across the Atlantic calls for a considerable amount of gasoline, particularly when conditions are such that the plane cannot be fueled along the way but must carry its own supply from one end of the trip to the other. In long cruises of this sort, the fuel becomes the major part of the burden, and therefore, power and gasoline must be expended for the transport of the gasoline itself. The gasoline is a "tapering lead," that is, it is greatest at the start of the journey and drops practically to zero at its termination so that the actual calculations respecting the amount of gasoline required are rather difficult.



This photograph shows the tremendous tank installed in Lindbergh's plane when he made his historic flight to Paris.

Let us assume, for the time being, that the engine is forced to its full capacity at all times, regardless of the speed or load. If the engine developes 300 H. P. at full load, and the fuel consumption is taken at an average of 0.5 pounds of gasoline per horsepower for each hour of flight, then the gasoline burned per hour will be; 300 x 0.5 = 150 pounds. In 40 hours this reaches a total of; 40 x 150 = 6,000 pounds for the trip, or about 1,000 gallons. In practice, however, the full horsepower is not employed through the whole trip but is considerably reduced after the first few hours of flying because of the gasoline consumed. Possibly, as a rough estimate, two-thirds of the above mentioned quantity would suffice.

From the accompanying photograph note the tremendous gasoline tank, at the left installed in Lindbergh's trans-atlantic plane. It completely fills the front of the fuselage and has a capacity of approximately 500 gallons. Vision to the front is therefore entirely obstructed making it necessary to use a periscope for forward vision, and the accommodations for the pilot are rather cramped to say the least.

It is necessary to place the tank as nearly as possible on the center of lift of the wings so that the decreasing weight of the gasoline will not disturb the equilibrium of the machine. The weight of the pilot, which is a constant weight, is relatively of little importance. In respect to the tank itself, great precautions must be taken against stresses introduced by the surging of the gasoline when the ship is in motion, and to this end, splash plates are installed to break up the motion, the splash plates in turn acting as bracing for the tank. Arrangements are also made for dumping the gasoline in case it is necessary to make a forced landing on the water.

Trick Glider Good for Land or Sea

B. J. PAGE has created a new type Glider in his "Aerobat" a low wing Monoplane, which is adapted to either land or water, with pontoon or wheel.

The photograph was taken on the Lake at Oklahoma City and shows the little ship in the water ready for a take off. The Aerobat is an all-metal job, has a wing, span of 40 feet and chord of 54 inches, which is made in two sections for transportation. Its length is 16 feet.

XUM

My First Solo

What does the student pilot think of on his first solo flight? An Australian flyer relates his sensations.

By Percy B. Prior

It is extremely interesting to note the peculiar expressions used by Mr. Prior who writes from Sidney, Australia. The only words that may be puzzling are "Tarmac" which is the apron in front of the hangars and "Petrol" which is the fuel or "gas" used.

"SWITCH off—Petrol on—Suck in." The mechanic having with great matter-of-factness delivered himself of the mouthful, I did my best to repeat the words quite as unconcernedly as he uttered them, whereupon after a few brisk turns of the propeller he shouted "Contact". With my heart in my mouth, for I was about to take an aeroplane into the air for the first time all by myself. I cried "Contact", simultaneously pulling the ignition switch to the "on" position. The mechanic gave one mighty heave on the propeller, resulting in the engine coming to life with a great roar, the intensity of which was positively terrifying. Never had it sounded so loud, never had my throat felt so dry, even in the boxing ring.

"This won't do," thought I, "I'll be knocking that blinking fence (about half a mile away) over if I don't take a pull."

The "pull" having been accomplished, I half opened the throttle, at the same time moving the "Fine adjustment" lever slowly forward to what I judged, hoped, and prayed was the right position—for if it is too far forward as you are leaving the ground the engine will "choke" through too rich a mixture of petrol, and if too far back it will "starve" through too weak a mixture, the result very often being disaster, except in the hands of an experienced pilot. Unless the requisite number of r. p. m.'s are forthcoming the plane is compelled to descend to terra firma, covered by houses and telegraph poles and other obstacles, or so it seems to the fledgling.

WITH these and kindred and comforting thoughts flashing through my mind, I "revved" the engine up to 1250 r. p. m., and the adjustment seeming correct I throttled down, casually signaling to the mechanics to pull the "chocks" away. With a final glance at the "sausage" to note the latest direction of the wind, having received the "all clear" signal from the leading mechanic, I slowly opened the throttle. The plane began to move forward, until with a sort of "do or die" feeling I opened the throttle wide. Slightly forward with the "joystick" to lift the plane tail off the ground, and then as the speed increased I gently pulled the stick back, feeling the ground sink beneath me.

"By Jove! I'm in the air, anyway," thought I, "and I have missed the perishing fence—now what height shall I go? Five hundred feet at least before I turn, just to be on the safe side this time."

A few seconds later the altimeter recorded 500 feet, but the ground looked so terribly close that I decided to make it a thousand feet before venturing to turn. This went on till I reached three thousand feet, when I said to myself, "Now I'll turn." But no, it was not till twenty minutes later that I essayed a gentle turn to the left. This accomplished, I felt I had not put enough bank on, as I had "skidded" a bit. Still I felt better, and executed, without mishap a turn to the right—a good 45 degree turn.

"Ah! this is something like—I think I'm pretty good; in fact I'll go a little lower, just to show those guys on the 'Tarmac' what I can do."

Switching the engine off, I started on a long, gentle glide, which proved most soothing. At one thousand feet I switched on the engine again, and looked down at the aerodrome, to see an ambulance pulled up on the "Tarmac", with lots of black smudges with white dots, faces of the other guys watching me. Suddenly all my fears returned.

"What's that adjectival ambulance doing there, I wonder?"—Swearing hard to try and bolster up my courage. "Has someone crashed? No, Good heavens! I'm the only one up. My sainted aunt! Something must be wrong."

Upon calmer reflection I remembered that the ambulance was only a necessary precaution in case of accidents. My "wind up" thus abating, I suddenly remembered the others who were watching.

"Hm! I'll show the blighters what I can do. Dammed if I don't 'loop the loop.'"

SUITING the action to the thought, I opened the throttle wide, till the air speed indicator showed 125 m. p. h. and then back with the joystick till the earth disappeared, and I seemed surrounded by miles and miles of sky.

"Slight left rudder, to counteract the torque of the propeller, and switch your engine off when the earth comes into sight again," said I to myself. At the top of the loop the bus seemed to almost stop, and I felt my weight go on the belt.

"Lord! Will she never go over?" I cursed, and then an increase of speed as the earth shot into view again, and I thumped back onto the seat. "Gosh! Nearly forgot to switch the engine off"—this as I glanced at the air speed indicator. The dive had commenced, and I was rushing toward earth at 90—100 m. p. h., the speed was quickening. At 150 m. p. h. I decided it was time to pull out of the dive.

Gently back — back with the "joystick". "Christmas! How stiff it is—wonder if anything is wrong"—forgetting that the increased velocity of air rushing past the elevators naturally made the controlling joystick harder to manipulate. But no, we gradually came out of the dive, until once again we were flying on an even keel. "Phew! Don't think we will do that again, not today at any rate."

From the aerodrome a white Very's light soared up, reminding me with appalling suddenness that I had to land. Once up in the air the question of descent had eluded my mind. Now all my former fears returned in full strength.

"Holy smoke! How on earth am I going to land in that tiny paddock"—for so the aerodrome appeared from a height of two thousand feet. I dithered on until another white Very's light flared up. "Well, its got to be done," I reflected. "So here goes."

Switching the engine off, I started to volplane down, vowing by all the saints that whatever happened I would not get into that accursed ambulance. As my height decreased so the paddock became larger and my confidence gradually grew. Until at last I felt I could at least hit the ground without hurting myself. 100—50—10—5 feet. Back—back with the joystick as the plane skims along a few feet above the ground. and then as she commences to drop, right back with the stick. The under-carriage and tail-skid struck the ground simultaneously, and I realized to my intense surprise that I had fluked a three-point landing, which is the hall-mark of a real pilot. I then taxied onto the "Tarmac", never before having felt so glad at being on good solid mother earth again, to be greeted by the instructor with "Not a bad landing, young man, but was that a 'loop' you were trying to do?"

But that's a way even the best instructors have of talking to their best pupils. Still, it was a bit rough on me, after accomplishing a perfect three-point landing, and without breaking anything, to be talked to like that after my first "solo", don't you think so?

Woman Will Attempt Trans-Atlantic Glider Tow

MISS IRENE JUANITA CHASSEY, a girl pilot of Hartford, Conn., is planning a transatlantic glider trip from Europe to America during the coming summer, towed by a 500-ft cable from the stern of a fast steamer. The machine, in which she proposes to make the attempt, is now being built at Jackson Heights, L. I. It is a cabin model, with dual controls, and is considerably larger than the one used by Frank M. Hawks in his cross-country flight towed by an airplane. It has two pilot seats in the cabin, one located behind the other, so that each can be converted into a reclining chair when one pilot is resting between turns at the controls. It will be one of the largest gliders ever flown. John Butler Betterly of New York, an expert flyer of gliders and motorplanes for the past few years, will accompany Miss Chassey as co-pilot.

It has not definitely been decided what steamer will be used as a tow or what two ports will be the start and terminus, but the final choice will be one of the express liners, such as the Bremen or the Europa, and the hop will be from an English or French port to New York.

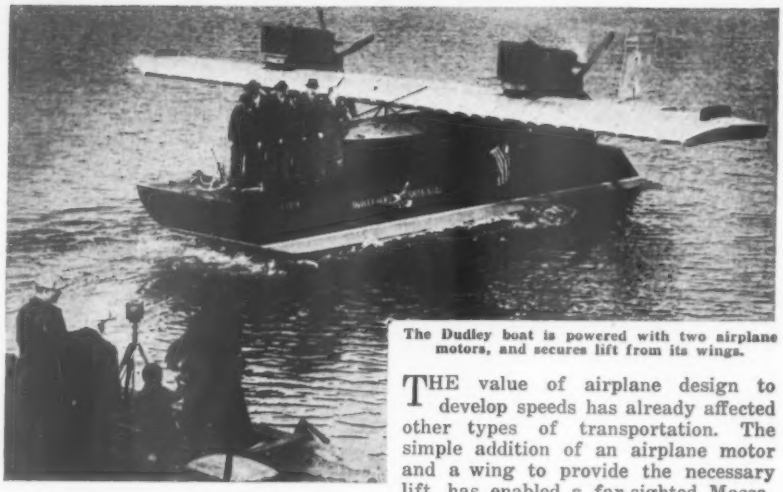
Under ordinary conditions the glider will circle as far to the rear of the towing ship as possible, keeping the rope loose and following the course of the liner. If the cable begins to tighten they can prevent its doing so suddenly by nosing down a little to increase the forward speed, while following winds that tend to nose the glider down will be fought by turning the machine back into the wind and letting the liner tow it backward. The cable being attached to both the glider and the towing ship by pivots, it can be effective at any angle. At night a strong searchlight will be played on the glider, to keep it in view from the steamship.

The principle difficulty will be with storms and tail winds on the way, if there are any. A thunderstorm, with winds blowing from all directions and in heavy gusts would take away the lifting power, and the glider would have to come down, but if they are forced down they will take off again as soon as possible, and make the trips in as few hops as possible. The original take-off will be in tow of a motorboat as soon as the liner gets under way, after which the cable will be dropped to the stern of the boat, which must have at least fifteen knots of forward speed to keep the glider in the air. A plan is now being worked out by which hot food and liquid refreshment can be sent up the cable from the ship to the pilots of the glider.

Smallest Parachute

A POCKET-SIZE parachute has been invented by an officer in the Italian Aviation forces, of the Army.

Speed Boat Fitted Like Airplane



The Dudley boat is powered with two airplane motors, and secures lift from its wings.

THE value of airplane design to develop speeds has already affected other types of transportation. The simple addition of an airplane motor and a wing to provide the necessary lift, has enabled a far-sighted Massachusetts youth to build a water boat capable of excellent performance.

The accompanying photograph shows the "Silver Eagle," an aero speed boat as it was launched recently at the Butts shipyards, Quincy, Mass.

It was designed by Paul K. Dudley, a Fitchburg, Mass. youth and is fitted with two 450-horse power Liberty motors and driven by airplane propellers.

After satisfactory tests the craft will visit New York and then Florida. From there she will proceed to Cuba and possibly across the Atlantic.

Chinese Students Learn to Fly in America

DATING back from the earliest days of mechanical flight, the Chinese have always taken a keen interest in aviation, and there are but few flying schools in the United States that have not had one or more Chinese students at some time or other in their history. Whether this interest in aviation is a heritage from their kite interest is not known, but the fact remains that a Chinese student generally looms in the offing in case that the traditional Jap is missing from the picture. Generally speaking, the Jap and Chinese students are not in attendence at one time but relieve each other in relays —Japanese today and Chinese tomorrow as it were.

A group of Chinese students learning the rudiments of flying at an American aviation school.

We have with us in this picture a typical group of four Chinese students looking things over in general. These particular students are graduates of a well known English university and are well acquainted with our language and customs. It is interesting to note that each of these students has signed a bond pledging his loyalty to the Nanking government which is financing his studies, so as we say in the title, we are witnessing the actual development of prospective Chinese aces.

Unusual Biplane Passes Successful Tests

DR. A. A. MERRILL, Dr. A. L. Klein and other experts of the aeronautical school of California Institute of Technology have perfected a biplane whose lower wing may be moved latterly from the cockpit and the pilot can set it to conform to the speed of the motor, thus counteracting stalling tendencies while in the air. It is also claimed that the wing can be so set that the plane will be able to stop within thirty feet on landing. In the illustration, Dr. Klein is seen seated in the cockpit of the tiny plane.

By J. B. ROBERTS

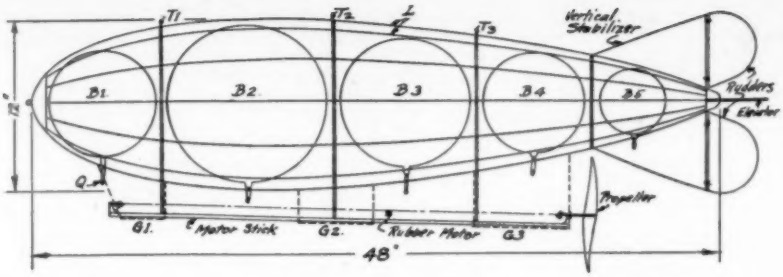


Fig. 1. Framing diagram of the "Baby Zepp."

How to Build a Flying Model Zeppelin

Five toy balloons are joined together to make a model dirigible that can be flown indoors. It is very simple to construct; try it.

BUILDING a flying model Zeppelin is somewhat of a novelty in model circles, and yet the writer built a dirigible model of the same general type for a banquet many years ago—sixteen years ago to be exact. It is essentially an indoor model for it goes wild with the slightest breeze and can hardly be controlled in any draft strong enough to be felt distinctly on the face. If carefully made, it is quite impressive, however, and well worth the trouble and time taken to build it. I believe that you will get more real kick out of it than out of many flying stick models costing much more and requiring more labor.

At the bottom of the whole affair, the motive as it were, is the common toy rubber balloon filled with hydrogen gas and sold by balloon peddlers in nearly every city. If the balloons are not available, then the little rubber sacks can be obtained from a novelty house and later inflated at home by a simple hydrogen generator that I will describe. If you know someone at a metal welding plant, or even if you don't, the balloons can easily be inflated from their high pressure hydrogen tanks. This is the simplest and best way of solving the problem of getting hydrogen gas.

Almost any size of dirigible can be made, but the one that I am about to describe has a diameter of twelve inches, a length of four feet and carries five balloons that are capable of being inflated to a diameter of approximately twelve inches.

FIG. 1 is what is known as a "Framing Plan" or a diagram that shows the structural members, the control surfaces, the balloons and the motive power. This dirigible is of streamline form—rather shorter in proportion than a true Zeppelin but much easier to build. If we were to build it to the true proportions of a "Zepp," having a length about fifteen times the diameter, it would take too much work and require too many balloons. As it stands, it is more of a "Blimp" than a "Zepp," but this need not concern us.

The five large circles, B1, B2, B3, B4 and B5 represent the five rubber balloons. The rubber bags are all of the same size but some are inflated more fully than others in order to conform with the streamline shape. Balloon (B2) is inflated to about twelve inches while the others dwindle down toward either end. A small glass tube or quill (Q) projects slightly beyond the hull for convenience in filling with gas when the leakage is to be replenished. All of the balloons are inclosed within a cage of rattan or reed strips (L) which are known as the "Longitudinal Girders," and the girders (L) in turns are spaced and held at the proper distances by the stiff cardboard "Transverse Rings" (T). Altogether, there are twelve longitudinal girders spaced equally around the circumference, and held in place by running them through holes drilled in the transverse rings. They are afterwards glued to the rings when properly spaced off and adjusted. At the nose is a piece of cardboard or heavy paper formed into a cup shape while wet, and the ends of the longitudinals are stitched to this nose and the tail piece.

The diameter of the rattan longitudinals is about one-sixteenth inch, and I wish to call your attention to the fact that the cage must be made as light as possible as the lifting power of the balloons is decidedly limited. To go to the work of making the cage, and then afterwards finding it too heavy for the balloons to lift is certain to lead to a lot of disappointment. At the most, it should not exceed two ounces, and by sandpapering down the rattans it can be made a lot lighter than this without sacrificing strength. Rattan is very light, much lighter than wood, and is much more easily worked into shape. The rattan can be obtained from a worker in basket type chairs or from an upholsterer or furniture house.

FIG. 2 shows how the cardboard transverse bracing rings are laid out, the ring shown here being the large ring (T1) shown on the side elevation. Twelve one-sixteenth holes are laid out evenly spaced around a circle and then carefully punched or drilled to take the rattans. The ring is not actually a ring but a twelve sided polygon so that it will take on the appearance of the real "Zepp." In getting the diameter of the various rings at the different position, it will be a good plan to layout the outline of the side

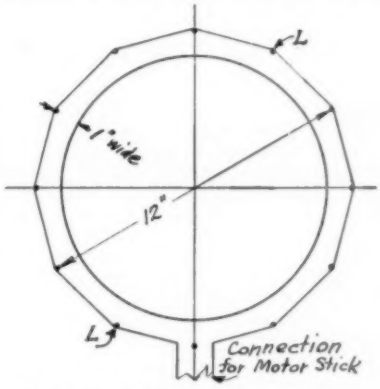


Fig. 2. Detail of a typical transverse ring.

view full size on a piece of wrapping paper, and then determine the exact diameter of the rings from this drawing. Bristol board or any other hard surfaced cardboard is excellent for making the rings, for such paper is stiff and strong. The thickness of the ring measured on the diameter is about one inch (1") as indicated.

Hung below the hull, and attached to it by glued pasteboard clips, is a typical motor-stick about thirty inches long. This carries the skein of rubber for the motive power, and at the end of it is an eight inch propeller. The motor stick should point down to a

slight degree, so as to provide clearance for the propeller without hanging the motor stick too far below the hull. Anyone at all familiar with model aircraft need not be told how to prepare this rubber motor or the bearings used with it. Less rubber should be used with this dirigible than with a model airplane for the problem is to get a motor that will run for a considerable length of time rather than one to produce a great amount of power for a short time. The buoyancy is provided by the gas so that only enough power is required for propelling the ship forward.

To complete the resemblance to the Zeppelin, small "Gondolas" or cabins (G1-G2-G3) are supported below the hull along the motor stick. These can be made of thin white writing paper, and if desired, the doors and windows can be painted on them or laid out in pen and ink. The tail surfaces, such as the vertical and horizontal stabilizers, the rudders and the elevators, can be outlined by very thin bent rattan, heating the rattan over a gas flame while bending it. The rudders and elevators are wired to the stabilizers so that they can be turned when it is desired to fly in a circle, ascend or descend.

After the frame work is completed, with the balloons inside, we are ready for covering it. Various covering materials can be used such as tough tissue paper, very light thin silk or the materials ordinarily used for covering model airplanes. After the covering is completed it can be "doped" just like model wings to get a taut smooth surface. This model can be made surprisingly light and it must be surprisingly light if it is to fly with the modest amount of lift provided by the hydrogen.

A COMPLETELY assembled side view is given by Fig. 3. This shows the dirigible after it is covered and ready for flight. A loop in the nose is for the purpose of attaching the thread called the "mooring line," a useful at-

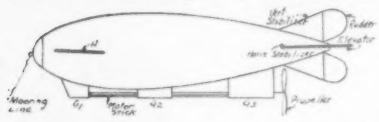


Fig. 3 Side elevation of the completed model.

tachment when the "Zepp" shows an inclination toward hovering about the ceiling out of reach. Sometimes better results are obtained when a forward horizontal elevator (H) is attached at the nose. When this elevator, indicated by dotted lines, is given the proper angle, the forward motion tends to hold the nose up so that it will ascend simply by the thrust of the propeller.

We are now ready to inflate the balloons, or "ballonets" as they are called in the full size ship. The job of inflation with hydrogen gas is easier and quicker if we carry the ship to a welding plant where they can fill her up in a jiffy from their tanks. Be sure that they use hydrogen and not acetylene, for acetylene gas or illuminating gas are far too heavy and do not give sufficient buoyancy. If hydrogen gas is not available then we must make our own generator as shown by Fig. 4, or use a similar apparatus that we will probably find in the laboratory of the high-school.

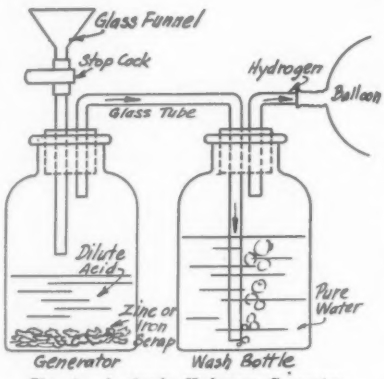


Fig. 4. A simple Hydrogen Generator.

AS SHOWN in Fig. 4 we have a wide mouthed glass bottle marked "Generator," with scraps of zinc or iron at the bottom. A little water is poured in, then hydrochloric acid is poured very slowly into the funnel with the stop-cock or pinch-cock open. As soon as the acid is added, close the stop-cock, and almost immediately you will see bubbles of hydrogen rising through the acid. As the gas also carries acid fumes with it, it will be necessary to force the gas through a washbottle filled with water. The acid fumes dissolve in the water while the pure hydrogen passes out through the tube at the right where it enters the balloon. You can undoubtedly find these parts at the high-school, or if in a large city, you can get them from a chemical supply house at a moderate price. The acid can be obtained at any druggist.

Add the acid very slowly and carefully so that the fluid will not bubble and froth at the outlet, and again, if the acid is added full strength or too rapidly, it is likely to generate so much heat that it will crack the bottle. If you should accidentally get any acid on your hands, wash it off promptly in cold water for it is very corrosive and will destroy about everything that it comes in contact with except glass. Zinc scrap is the best material but small pieces of iron or iron filings are also used. Hydrogen is very inflammable so we must be careful not to bring open flame near the generator or the balloon.

After the ship is filled, then comes the task of attaching weights to it so that it is just barely able to rise. The weights must be shifted about until the ship comes into equilibrium in a horizontal position, a task that is not always very easy. Even though it may not have enough lift to rise by itself, it can be adjusted so near this point that the thrust of the propellers will carry it into the air. In some cases, it is desirable to ballast it so that it is just short of lifting, and then depending upon the propeller to provide the lift when the ship is propelled horizontally through the air.

A great many very informative experiments can be tried with this little ship at a very small expense and I am sure that you will enjoy the job as much as I did when I built the first much as I did when I built the first one.

GIANT BOMBING PLANE IS LANDED ON ONE WHEEL

Lt. Green lost one wheel on taking off but lands safely

SUCCESSFULLY accomplishing the hazardous feat of landing a huge bomber with only one good wheel, Lieut. William Groen, Jr., Rockwell Field pilot, saved his life and that of five enlisted passengers on the afternoon of March 4th.

Lieut. Groen was piloting a Keystone LB-7 bomber and took off as one member of a three-plane formation. In some manner one of the wheels of the plane was so badly damaged in the take-off that it was useless, but those in the plane were unaware of the fact. When those on the ground saw what happened, Captain H. M. Elmendorf and Lieut. I. A. Woodring took off in pursuit of the bomber, and by diving and other maneuvers attracted the attention of the occupants of the bomber. A mechanic looked over the side, saw what was wrong and wrote a note to Lieut. Groen, explaining the situation. By this time the bomber was at an altitude of about 1500 feet.

Circling down over the field, Lieut. Groen signalled that he was about to land. All precautions for an accident were taken at once. The army ambulance and the fire engine took up stations at the indicated landing place, and with breathless interest those on the ground waited for what they feared might be a serious crash. Lieut. Groen, however, was master of the situation and, tipping his plane away from the side on which the damaged wheel was attached, landed on one wheel, bumping along over the field until he was no longer able to balance the slowing plane. There was a crash and a ripping of fabric, and the plane settled down in a cloud of dust. Ambulance and fire engine crews rushed to the spot but, happily, they were confronted by the pilot and crew of the plane emerging unhurt from the wreckage.

One wing of the plane was wrecked, but neither the motors nor the propellers were damaged. Fellow officers declared that Lieut. Groen's landing was a perfect one and that his skill alone averted what might otherwise have been a major accident.

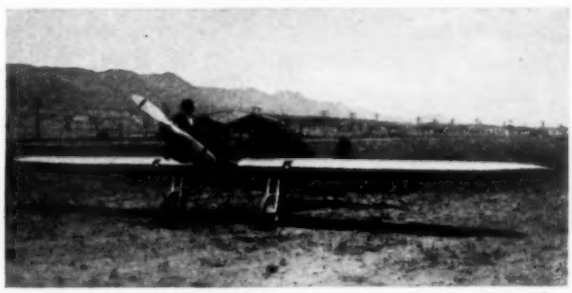
Can You Name These Planes?

The eight planes shown here are included in the following list of manufacturers:—Inland, Laird, Great Lakes, Consolidated, Pheasant, Spartan, Ford, Alexander, Arrow, Sikorsky, Fairchild, Fokker and Curtiss. The correct answers are on page 81.

1. A popular sport biplane built at Havelock, Nebr. Note the sharply staggered tapered wings and the unusual shock absorber mounting above the lower wing.

2. This model is usually a 2-seated sport plane. It can be identified by the mounting of the Cirrus Engine, the sweepback of the upper wing and the neatly rounded tail surfaces.

3. This is a brand new model from Tulsa, Okla. and is not yet as well known as the three-place open biplane by the same maker but you may be able to guess it by the similarity of fuselage lines.



4. This plane was designed for "four people and a dog." Note the low cantilever wing and retractable landing gear. The plane has won a number of racing trophies as it is fast for its power.

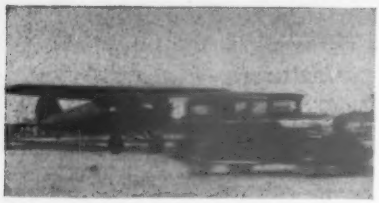
5. Another 2-place tapered wing sport biplane. This is an excellent performing plane manufactured in the East, but probably not as well known as the folding wing cabin monoplane by the same maker.

6. Kansas City is the home port of this two-place, side by side seating parasol monoplane. This plane holds the world's speed record for planes of its class over a 100 km. course.

7. One of the largest flying boats ever built in this country. A fleet of these planes are being used for passenger service from Miami to South America.

8. This newest and largest addition to a famous line of planes is the largest land plane in America. It is being used by one of the Western air lines and will carry over thirty passengers.

A Race Between Airplane and Automobile



A UNIQUE airplane versus automobile acceleration test held recently at the Detroit Municipal Airport resulted in a thrilling run which observers declared a dead heat.

A friendly controversy between Edward F. Schlee and Billy Brock, famous round-the-world flyers, finally resulted in a modest wager and an actual acceleration test. Schlee, having driven one of the new Oakland V-type Eights, asserted that "nothing could touch it for get away and fast pick up."

"Possibly an automobile," retorted Brock, "but how about the Lockheed Vega monoplane?" The Lockheed, with a top speed of 135 miles per hour, is one of the fastest commercial planes built.

The next day the noted flyers lined up on the municipal runway, Brock at the controls of a Lockheed and Schlee behind the wheel of an Oakland Eight sedan. At the drop of a flag both vehicles were "given the gun." They leaped away, the Oakland in the lead and the propeller "wash" from the plane blowing the starter's hat into the middle distance. Schlee kept the Oakland in second gear until it was "doing forty," then snapped into high. He still was accelerating at 55 miles per hour when Brock caught him just as the plane left the runway only 250 feet away from the starting point. The plane then soared upward and left the car behind. Since the car and plane were "nose and nose" when the latter took off, the contest was declared a tie.

The Modern Way to Preach Religion

A PRIEST, accustomed to traveling weeks at a time by dog sled to visit the scattered families of his Alaskan parishes, will in the future cover the same territory in a few hours by airplane.

The Rev. Father George H. Woodley, a Jesuit stationed in the diocese of Bishop Crimont at Anchorage, Alaska, is the first flying priest of North America.

Father Woodley (left) and his brother, beside the Fleet plane which is used by the priest in covering his four parishes in Alaska.

He is in charge of four parishes and for many of the families he is their only contact with the outside world, a bearer of supplies in bad weather and of medicines when his people are ill.

Father Woodley, in carrying out his duties, has spent most of his time behind the dog team, riding in all sorts of weather over snow-covered land. In good weather it has taken him three weeks to visit the four parishes, often a week of continuous riding to go from one parish to another.

On a leave of absence last fall Father Woodley returned to his home in Quincy, Mass. to find that his brother, Arthur Woodley, had become interested in flying. The two brothers talked about the advantage of using a plane in Alaska and Father Woodley, with the consent of his superiors, decided to become a pilot. Shortly afterwards, he purchased a Fleet training plane and now is receiving daily instruction from his brother. By spring he hopes to obtain his transport pilot's license and when he returns to Alaska he will take with him two Fairchild cabin planes.

"In case of serious illness," Father Woodley says, "it often takes a week or ten days for word to reach us in Anchorage and another week to get to the patient. By the time I arrived it was too late. With a plane I will be able to carry the sick to hospitals in two or three hours where they can receive proper medical attention and care.

"The needs for airplane travel in my work are great. By means of planes I not only hope for greater efficiency in my religious work but also to be able to bring help and assistance to many who would otherwise perish during the winter months."

Father Woodley's planes will be equipped with skiis for winter, pontoons for summer and wheels if the weather permits ordinary landings. The territory which it has taken him three weeks to cover can now be traversed in one week and he will be able to carry supplies and emergency rations to parishes which are snowed in.

A Collapsible Boat to Aid Transatlantic Flyers

TO PROVE that his unsinkable "kayak" will be a satisfactory lifeboat for aircraft on trans-ocean flights, Kai Pless-Schmidt recently made a nine day ocean trip in his tiny craft from Faroe Islands to Bergen, Norway. The trip ended in disaster when Pless-Schmidt encountered an eight ton whale near the Norwegian coast and for three days and nights drifted helplessly in heavy seas until rescued by a fishing boat.

The object of the trip was partially accomplished for the mariner proved that an airman, after a crash at sea, might reach safety in this boat. The craft carries three persons and inside there is room for folding rubber boats which it could tow, and thus thirty-two persons could be accommodated in an emergency.

The boat was equipped with two sea horse outboard motors. It is unsinkable and during a storm can be closed airtight. Let into the deck is a hexagonal lookout turret that affords a view in all directions when the boat is closed. It can be steered from the inside. In heavy seas the pilot lays down inside the boat full length and shuts the cupola.

Mr. Pless-Schmidt intends to cross the Atlantic next year in a similar boat of smaller design.

More Speed is Needed

IN THE opinion of F. Trubee Davison, Assistant Secretary of War for Aeronautics, aviation will not develop as rapidly as it should until higher speed is developed. "Most large commercial transport planes in this country can only cruise at 100 to 120 miles per hour. This is not fast enough to justify the increased cost required to operate an airplane, over and above other existing means of transportation."

Training in a Powered Glider

By GERALD B. BURTNETT

Mr. Crawford teaches fledglings to solo within 20 minutes in his powered glider. A top speed of 50 m.p.h. and a landing speed of 5-15 m.p.h. permits students to learn by trial and error.

Clyde Schleiber, age 16, successfully landed a Crawford glider at 45 m. p. h. on top of a speeding motorboat.

THEY walked across the field, the instructor and a pupil, to where an odd appearing contrivance rested on one wing. Rather apprehensively the pupil was strapped into the seat. He grinned nervously at a crowd of high school boys who grinned back with rare expectation.

He had never had a "stick" in his hand before. But his pal had been gloating over him, because he was a flier with two hours to his credit and no red-blooded boy can withstand such superiority long. He listened attentively while the instructor explained the simple controls. Then the propeller was spun, a last minute warning shouted and he was alone.

Gingerly he pulled back on the gas control bar in his left hand. The four cylinder motor cycle engine "revved up" and the craft spun around crazily in a wide circle with the wing dragging. He dropped the gas control as though it was red hot and grinned again, rather sickly, as the craft stopped its gyration.

Another word from the instructor and his confidence returned. Again he "gave her the gun" and the whirl started. But he adjusted the stick and the wing lifted from the ground. Sitting upright in a little bucket seat he seemed frozen to the controls. The glider was gaining momentum, now it was up on its single wheel and running across the field.

L. R. Crawford at the controls of his glider. The method of driving the propeller is clearly shown. His right hand is clutching the throttle.

Almost at the end of the runway it turned, not skilfully, but undecidedly and rolled back to the starting point with the motor roaring. The motor was cut, again the wing sank to the ground. The instructor walked over and answered some questions. Again that grin. This time there seemed to be more confidence behind it. A wave, maybe a bit condescending, to the "bunch" and away he went down the field again.

Twenty minutes later that high school boy had hopped his ship off the ground. Up fifteen feet and down, rather bumpy but safe. And as he joined his gang, onlookers might have detected an emphatic strut. He too was a flier.

HAVING heard of this school where embryo fliers were being put into the air in any time from twenty minutes to two hours the writer approached it with a "from Missouri" attitude. And they showed him, that class of youngsters, that learning to fly was pretty much a matter of proper training craft.

The nearest thing to a real flivver of the air is the Crawford powered glider designed and built by William F. Crawford of Seal Beach, California, and used by him in training fledglings. According to Mr. Crawford, his is the first open power glider ever built.

It is a high wing monoplane with an open framework fuselage. The pilot sits in a little bucket seat suspended from the center of the wing with four cylinder motorcycle engine directly in front of him.

The wings are large and substantial looking with a surface of two hundred square feet, a span of forty feet and a chord of five feet. The total weight of the glider is three hundred pounds complete with the four cylinder motor and a five foot propeller.

The motor is geared with fifteen teeth to a counter shaft with twenty-eight teeth and a chain drive is used to transmit power. The tail surface is a huge single flipper with fifty feet of surface and an exclusive Crawford feature. He has used this type tail on many single and tri-motored aeroplanes

he has built and flown. Its chief advantage is prevention of dives or spins, his claim being that the powered glider will not do either.

A two hundred pound pilot is easily lifted by the glider and can attain an altitude of four thousand feet with a full gasoline load. The top speed is fifty miles per hour with a gasoline consumption of two gallons or twenty-five miles to the gallon.

The landing speed varies from five to fifteen miles per hour. Crawford has

The Crawford glider is shown in flight.

often startled experienced pilots by dropping the ship almost straight down from an altitude of one hundred fifty feet and landing at a five mile speed. He says that he can pancake the craft from the same altitude and come down to a straight line landing within a foot of a designated mark, a feat that cannot be performed by either aeroplane or parachute.

CRAWFORD'S idea in producing the powered glider is to meet the need of airminded persons who want to fly and cannot afford an aeroplane. The flyaway price of the four cylinder job is about the same as its brother, the road flivver.

The chief value of the glider is for training purposes, Crawford says. Pointing to the technique of the German aeroplane pilot, Crawford explains the value of gliding training in this way.

Each German flying student is required to have a two year glider training before he can secure an aeroplane pilot license. Any pilot who has had glider training is a better pilot and experience has shown that the average person can learn to fly more quickly and more safely if he is glider trained. The power glider forces the pilot to learn how to outwit a motored ship and one must outwit a ship in order to control it.

Most aeroplane fliers get into trouble in "stalls". The power glider is constructed to meet the stall condition and overcome it. Thus the power glider trained pilot recognizes a stall and knows how to outwit it when he graduates to the high powered, high speed plane.

In addition to the spinless, diveless and stalless qualities of the power glider its light weight eliminates danger in case of a crash. The training ship used by Crawford has been dropped from all angles by all kinds of students and bounces merrily to a stop while the pilot makes sure all his teeth are present.

Good motorcycle riders seem to catch on to the requirements of power glider flying more readily than others. Crawford attributes this to their knowledge of throttling, balance and speed. Usually these boys are soloing in one hour, while the average beginner takes two hours to make his first hop. But it has been done in twenty minutes, several times in fact.

A LARGER glider for distance flying is also being marketed by Crawford. It has a three cylinder Szekely engine of forty horse power with a top speed of sixty-five miles an hour and a landing speed of ten to fifteen miles. Its ceiling is ten thousand feet and its range four hundred miles.

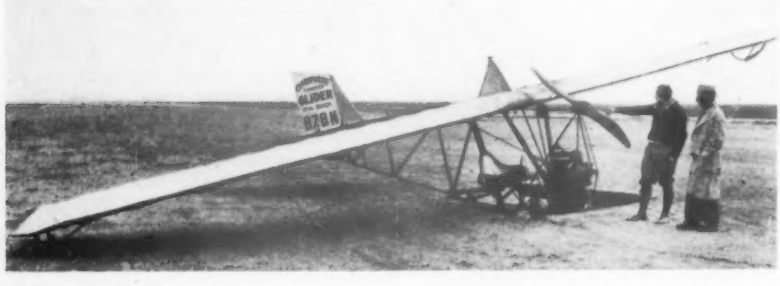
It was this ship that a sixteen year old boy piloted over Long Beach harbor and landed on the roof deck of a motorboat speeding at forty-five miles per hour. After resting there for a few minutes he took off again, circled and landed several times for the benefit of a news reel photographer.

The landing skid of the power glider with its single wheel always induces questions. When the motor is gunned the chart rocks up on its single wheel and takes off with a run of about twenty-five feet. In landing it balances on the wheel until speed slows to several miles per hour when it rocks back on the skid and one wing settles to the ground. Skids are also provided on each wing.

Placing of the motor in front of the pilot and under the wing makes the center of gravity very low and is an added safety factor, Crawford explains.

Should anyone question the statement that the day of the powered glider is here tell him to take a trip to Seal Beach, California. Every day at least ten students are learning how to fly with Crawford and on Sunday the training plane gets no rest from dawn to dusk. It seems rather miraculous to see a raw beginner doing figure eights at one hundred feet after an hour or two of training. But it is being done. Ask Crawford.

L. R. Crawford explains the fine points of his father's powered glider to Mr. Burtnett (right), the author of this article.



A Primary Glider That Can Carry an Extra Passenger

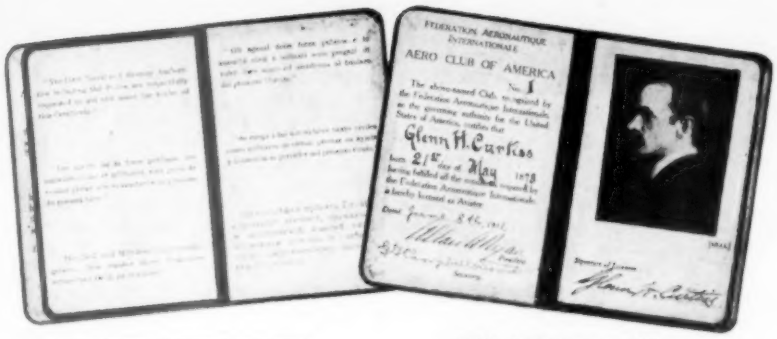
The Rhon Ranger, has successfully flown with two men, placed as shown above. For construction details on this glider see page 17.

WHEN you can put two people in a glider that was built to carry only one person, and then launch the glider, and find that it flies excellently, you will have to admit that it is some glider. Such was the case of the "Rhon Ranger" made by Mead Gliders.

In the photograph can be seen the position of the two full sized men in the glider just before they took off on their remarkable flight. They were launched from level ground with an ordinary ½ inch shock cord, and rose to a height of about 50 feet.

This primary training glider was designed by a German aeronautical engineer who used an entirely new and different wing foil than has ever been used on a glider before. The construction of the glider is of wood throughout, thus making it very light in weight, besides low in price. Danger of breakage has been greatly eliminated by using a grade of wood in the front part of the skid which will absorb considerable shock, or even break itself (if too great a shock is given it) thus preventing breakage or strains in other more vital parts of the glider. In case this front skid does break it can be easily unbolted and a new piece put in. Thus we see that practibility and low cost of operation are also important features of this glider as well as performance records.

The first of a series of three articles giving full plans, specifications and directions for building the Rhon Ranger appears in this issue.



Pilot License No. 1

THE above photograph practically explains itself. It shows the first pilot's license issued by the Aero Club of America. It was issued in 1911 to Glen H. Curtiss. It is interesting to read the reverse side of the license, which says in six different languages that all government officials are requested to render assistance to the holder of the certificate.

Radio Interference

SUCCESSFUL reception of radio signals and programs is made difficult on aircraft because of the distribution of metal on the modern plane and also for the reason that there is a considerable amount of interference from the engine ignition system unless the receiver is properly shielded. The various short antenna systems employed on the average commercial receiver are not well adapted to flight conditions unless an unusually powerful receiver is employed. Loop antenna, so efficient on the home sets must be considerably revised and modified for use on the airplane.

How Aerial Maps Are Made

THIS photograph gives an excellent idea as to how an aerial camera should be adjusted for mapping purposes.

Note that a hole is cut in the floor so that the camera can be pointed straight downward. In this way the pictures taken can be overlapped to give a flat map, lacking perspective.

Smudge Pot Serves as Wind Indicator

THE latest in ground wind indicators for fliers is a smudge pot in use at a Los Angeles Airport in place of the conventional "sock." The pot burns crude oil and can be operated at a cost of 30 cents daily. Located in the center of the field, it pours forth a stream of white smoke, the wind wafting it across the field so aviators can determine from what direction to come to port. Miss Jacqueline Bobier, Glendale, California, is watching the first demonstration. The smoke is visible from 2,000 ft. elevation.

New $1000 Plane

THE "demand" in the aircraft field this year apparently is for a light sports-trainer airplane in the $1,000 class.

This is evident from the response to the announcement of the American Eagle Aircraft Corporation of this city that it will soon place on the market a featherweight airplane, the American Eaglet, powered with a two cylinder, twenty-five horsepower engine.

Caterpillar Tales

Lost in the Clouds

LIEUT. FREDERICK M. HOPKINS, Jr., was flying near Baltimore, Md., after encountering light rains, and decided to push on to Bolling, his destination. The O-1E, borrowed from the First Observation Squadron at Mitchel Field, was functioning as any First Squadron pilot will always tell you — perfectly—so the odds were in his favor.

About ten miles out, the black clouds to the west began to get blacker and nastier—a sure sign of fair weather ahead. To go or not to go was the question, but Lieut. Hopkins decided to run the clouds a race to Bolling. The closest he got to his objective was fifteen miles out, the clouds winning the race and enveloping him in a driving rain and wind that was nobody's business.

Freddy decided that he was all wet in more ways than one and that the best thing to do was to turn back. This decision was heartily seconded by Private Cook, who was holding down the rumble seat. After a heart-rending ten minutes more, with only snatches of ground visible, during which Hopkins divided the time between mopping his goggles and trying to see his instruments, he finally recognized Sparrows Point on the Patapsco River. Logan Field wasn't far, but getting there was another question.

Then the storm hit him in earnest, blocking out all visibility. The air speed was said to travel from 150 to 50 miles an hour and then back again in a sickening manner, and it became a case of guessing which way was up. In the midst of a nasty feeling quite similar to a spin, Hopkins decided to give up the ghost and told Private Cook to pull freight.

Private Cook did as he was told with remarkable alacrity. He stood up in the cockpit and found the only direction he could leave the ship was straight back. The fin dealt him a left to the chin and he went out like a light. Coming to a second later he was surprised to find himself in mid air, no ground in sight, and a chute evidently above him. But it wasn't all billowed out as chutes usually are. He glanced up and noted the very obvious reason, i. e., in the place of the dome of the chute was a great gap through which the rain and wind were sweeping. The tail surfaces had claimed the pilot chute and part of the main silk. Imagine the feeling of falling through the air, not being able to see the ground, and the only means of support a chute with nothing but the great open spaces for a dome. While cogitating on this fact, a tree came up and smacked him, and again the land of sweet dreams was his. When he came to the second time the battle was over and, aside from being bruised, he was uninjured.

The Dirigi-Plane for Speed Plus Safety

TO RETAIN the direct lifting properties and safety features of the dirigible and the speed of the airplane has perplexed many an aeronautical designer.

John Hodgdon, a California inventor, has attempted to solve this problem with his combination dirigi-plane. The inventor says the tests of his model have been eminently successful. If built on a giant scale, Hodgdon claims, the craft would rise and descend with the ease of a dirigible and by virtue of its streamline design, could be flown at high speeds.

Another Plane with Controllable Wings

EASIER take-offs, heavier loads and no danger of nose dives or tail spins are the advantages claimed for a new mechanical airplane wing control just invented by George Gardner, an engineer of Flint, Michigan.

Although their curve remains the same, both wings move as a unit, changing their angle as the plane travels through the air. The mechanism is operated by a lever located within the cockpit of the plane. By this means it is possible for the pilot to adjust the angle of the wings to suit his movements in the air.

Should the plane slip into a nose dive or tail spin, the wings may be shifted to pull the plane out. Greater ease in taking off and the ability to carry heavier loads are additional advantages claimed by the inventor.

For night flying, a set of lights is provided to inform the pilot of the adjustment of the wings regardless of his position in the air. The wings are locked into the desired position by a mechanical brake which can be held against terrific air pressure. Steel tubing extends through the center of both wings and fuselage, affording ample strength and rigidity. An operating model of the machine is being sent to New York University, where Dr. Alexander Klemin, head of the aeronautics school, will make wind tunnel tests to determine the actual performance of the device.

Ingenius Man Tries to Imitate Birds

A WING flapping flying machine which really works—is the dream of Peter Karabatsos of Oak Park, Ill. He is constructing his machine now. The wings have a spread of sixteen feet, and are covered with aluminum. They flap by means of levers attached to a

new type of motor, which he has not yet finished — a fueless motor. The tail will also be of aluminum. The whole machine straps about his shoulders like a piano accordion. It weighs less than fifty pounds.

Bringing a Burning Plane to Earth

FOR his exhibition of coolness, courage and judgment in an emergency which would have justified his resorting to his parachute in order to save his life, Major-General James E. Fechet, Chief of the Air Corps, addressed a letter of commendation to 1st Lieut. John D. Corkville, Army Air Corps, on duty at Wright Field, Dayton, Ohio.

While flight-testing an airplane at an altitude of 7,000 feet, a faulty carburetor caused the engine to cease functioning. In the consequent flooding of the carburetor, the raw gasoline pouring from the scoop was blown by the slipstream along the fuselage and into the bottom of the pilot's cockpit. This gasoline ignited and caused a serious fire in the cockpit.

Instead of abandoning the plane, Lieut. Corkville waited until the fire subsided and then proceeded to land safely at the home field.

"Your presence of mind and quick thinking on this occasion prevented a much more serious accident," General Fetchet stated in his letter, "and not only saved valuable public property from destruction but has permitted an investigation to determine the cause of the fire, which would have been impossible had the airplane been allowed to crash. Your conduct on this flight was highly commendable and is worthy of the best traditions of the Army Air Corps."

Immediately after the gas was ignited by backfire, Lieut. Corkville turned off the supply, but the heat in the cockpit became so intense that he made ready to jump. The act of cutting off the gas supply, however, caused the fire to subside sufficiently to enable him to return to his seat and glide his plane for a landing on the field. On the way down, at about 2,000 feet altitude, the gas was turned on again to try to catch the motor, but when he noticed the raw fluid again coming back in the fuselage, the supply was again cut off. Immediately thereafter the fuselage started blazing, but the fire lasted only a few seconds and burned out. When the gas was turned on again the engine started to run and the plane was landed.

Subsequent examination of the plane showed evidence of a very hot fire in the cockpit which burned through the fabric of the fuselage on the right side, burned off connections to the instruments and scorched the paint on the metal fuselage members.

A Joke On Ruth Elder

CLIFF HENDERSON of Air-Show fame tells the following story about Ruth Elder:

"During her flight in the Women's Air Derby, Miss Elder had to make an emergency landing. She was flying a bright red aeroplane. She landed her bright red plane in a cow pasture, and the cattle began to come over toward the plane. Somebody asked her what she did when she found out she landed in a cow pasture,—she replied that she prayed. When asked the nature of her prayer, she answered: "I prayed — 'Oh, God, make them all cows!'"

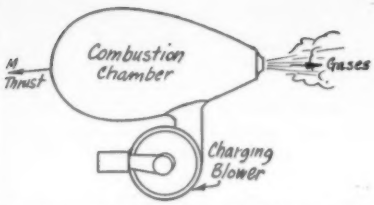


Fig. 2. A proposed reaction motor driven by the combustion of gasoline.

What Makes a Rocket Plane Go?

By JOHN B. RATHBUN

A simple explanation of the theory of rocket flight.

The trimotored rocket plane featured on the front cover is described on page 10, column 3.

WITH a rush and whirr, a rocket speeds gracefully up into the heavens, exciting the admiration of all beholders. It is nothing new, for countless other rockets for almost countless years have performed the same feat, and yet this rocket manifests the power of a principle that has received very little attention from the world at large and airplane constructors in particular—the principle of jet propulsion or reactance flight. True, we have the early experiments of Goddard and the later exploits of von Opal to point to, but in the main, jet propulsion has received little serious investigation as a possible substitute for propellers.

Perhaps it is the idea that black powder is an essential to jet propelled flight that has held back development along these lines, and as we know, gunpowder is not a desirable companion in the cockpit of any plane. A few half-hearted attempts have been made along these lines more with an idea to publicity than to actual practical merit but the final results are nil. Jet propulsion on the principle of the rocket may or may not prove a future possibility, and yet there are chances in this direction that are not wholly out of reason as we see the matter now.

LET us go back to our skyrocket of opening paragraph and investigate its flight. On examining the rocket head as shown by Fig. 1 we will see a paper container tube filled with slow burning powder, closed at one end (A) and provided with an orifice at the end (B). That is all there is to it—the acme of simplicity in motive power. After ignition by the fuse, the powder burns slowly and progressively producing a high pressure that throws the hot gases through the orifice to the right. If the orifice were closed, then the pressure on the head (A) would be equal to the pressure on the head (B) and there would be no tendency toward motion.

However, the orifice reduces the effective area of the head (B), and this difference in area causes unbalanced forces that in turn produce thrust in the direction of (M). If the area of (A) is four square inches, and if the area of the orifice is one square inch, then the difference will be one square inch between the front and rear ends. With a pressure of 1,000 pounds per square inch it is obvious that the thrust along (M) will be 1,000 pounds due to the unequal areas. It could be nothing else. This force can then be applied to the propulsion of airplanes, dirigibles, boats or what have you, regardless of whether the gases are produced by burning gunpowder, compressed air or compressed soup.

So long as a constant pressure is maintained at the orifice we will have a constant thrust (M), good weather or bad weather or without any atmosphere at all. I will ask you to particularly note that the force or thrust is entirely independent of the nature of the surrounding air, hence it is totally unlike the propeller which is influenced by local eddies, air density and similar variations. The essential is a constant pressure within the tube, and the area of the orifice.

AN EXPANSION of the rocket idea was proposed and experimented with to some extent a few years ago, gasoline being substituted for the powder. In general, this took the form of Fig. 2 where a mixture of gasoline and air was burned in the combustion chamber under pressure with the gases issuing from (a) as with the rocket. The combustion chamber was divided into halves, the charge burning in one half while the other half was being charged with gasoline vapor. By alternating the chamber divisions a constant stream of burned gas was maintained with a resulting thrust at (M). A pressure blower supplied the gasoline and air mixture as shown.

With a gasoline jet motor of the type shown, there are many difficulties to overcome, first the complication of the charging mechanism, and second, the comparatively low pressures attained by burning gasoline. There were further troubles with the highly heated walls of the combustion chamber and the internal mechanism so that this experiment in its state then did not lead to any revolutionary changes in plane propulsion. I do not mean to say that this type is discredited but that so far the primary difficulties have not been overcome. I disclaim any responsibility in making predictions, for just about the time one says that a thing cannot be done he is interrupted by the fellow that is doing it.

Fig. 1 The simple rocket.

HOWEVER attractive the jet propulsion by the direct application of the expanded gases may seem, I believe that there is a second system or intermediate method that is more probable. This, in short, is the air jet method shown schematically by Fig. 3 in which the reacting jet is a stream of air compressed by an engine driven multi-blade blower. At (B) is the multivane blower or turbine compressor driven by the engine (E), taking in air at the nose at (b-b-b) and then forcing it backward through the annular space (a-a-a) around the periphery of the nose fairing (N). This backward cylinder of air is the reaction stream that plays closely around the streamline fuselage.

This arrangement presents several practical advantages, one being the compactness of the power plant and its complete shielding from rain, sleet or other floating solids in the air. Secondly, the chassis can be made lower as it is not longer necessary to clear a large diameter propeller. A low chassis reduces head resistance and makes it

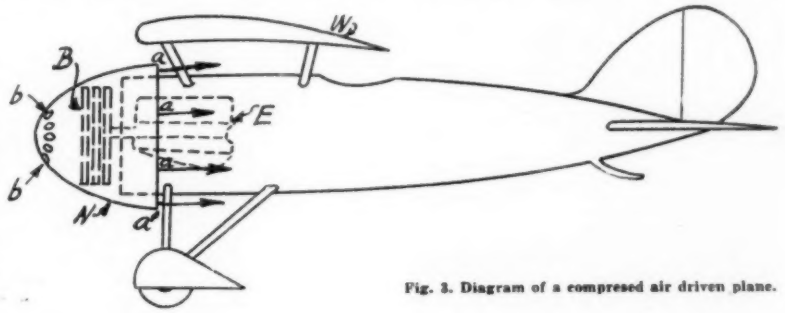


Fig. 3. Diagram of a compresed air driven plane.

easier to taxi over rough ground to say nothing of the saving in weight. Thirdly, the engine can be run steadily at a much higher speed with the blower rotator than with the usual propeller which means that the normal output of the engine is greater and that there is no loss efficiency due to a constant pitch propeller at various forward speeds. Due to reasons stated at the beginning of this article, the tnrust can be made constant under all conditions although this method is not outlined in full in Fig. 3. Note also that fewer parts are in the "slipstream" and that the parasitic resistance is correspondingly lower.

A multivane or turbine type blower is very efficient and compact and will run very nicely without gearing down at a speed of 2,200 to 2,400 R. P. M. at which the maximum results are obtained from the engine. Again, we can have a constant speed governed engine with the speed and thrust control by dampers in the louvres (a-a-a) and can

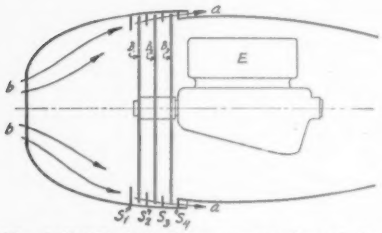


Fig. 4. Detail of the blower power plant of the compressed air plane.

apply heavy thrust at low speeds which is not the case with a coarse pitch propeller. The nose (N) is for streamlining the fuselage and for directing the air-stream.

A DETAILED section through the power plant is shown schematically in Fig. 4 and is lettered to correspond with the preceding figure. The air entering the nose at (b-b-b) passes outwardly through the stationary guide vanes (S1), through the three rotor stages (B1-B2-B3) and then exits through the final guide vanes (S4) and out to atmosphere through the annular opening ring (a-a-a). This is very simple and compact for the rotor of the blower is mounted directly upon the extended engine shaft (E) with no troublesome end thrust and with no danger of broken blades or running unbalance. A blower of this type, three or four

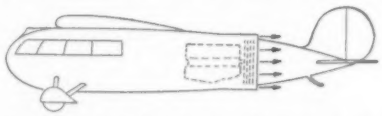


Fig. 5. With pusher jet propulsion, streamlining and cabin accommodations are greatly improved.

compression stages, can easily and economically maintain a pressure of over 8 ounces per square inch over the annular orifice (a-a-a) with a resulting thrust of 600 pounds with a small plane or still greater thrusts with larger blowers.

One of the greatest advantages of the blower jet propulsion lies in the fact that the power plant can be placed back along the fuselage as in Fig. 5 so that the nose and forward portions of the body can be used for the cabin of a cabin type or transport plane, giving better visibility than with the engine and propeller in the nose. Many years ago, the Gallaudet Pusher was arranged with a propeller track around the rear of the fuselage located where the blower is shown in Fig. 5, and while the advantages of an amidship power plant were proved, yet the poor propeller construction made necessary by this arrangment finally brought experiments to a close. This construction made it necessary to employ an internal gear on the Gallaudet with the propeller blades mounted on the gear, a complication that is altogether avoided by the reactance drive of Fig. 5.

A Woman Who Operates An Airport

WOMEN have crossed the Atlantic; they hold transport pilot's licenses; they have staged their own races and air circuses, but until now, no woman has ever operated an airport, one of the few fields that remained for "men only."

But even this branch of aeronautics has fallen in the hands of a woman, for Margaret Perry, famous Los Angeles pilot, recently bought the Culver City Airport, near Los Angeles, and will go into the active business of airport management and operation.

More than that, she will soon be the first woman in the world to conduct a flying school, as she intends to open a course of instruction at the airport within a few months. She has not yet decided whether the school will be for women students only, or if both men and women will be admitted.

Miss Perry intends to open the field about the middle of April. Until then, she is spending her time "dolling it up," making repairs on hangars and equipment, and smoothing out the landing field and runways with tractor and drag. In addition, she is handling

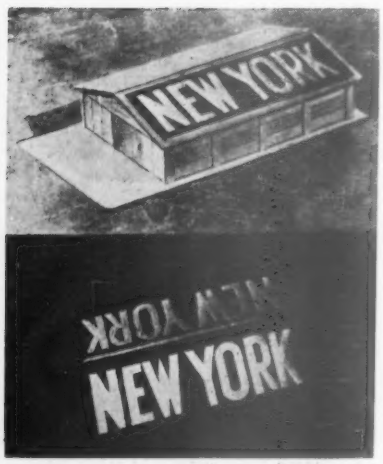
Margaret Perry, famous Los Angeles pilot, manages and operates the Culver City Airport, and plans a flying school there shortly.

whatever business drops in, personally refueling planes, and doing oiling and greasing as well as making minor repairs on planes.

Miss Perry is one of the sixteen women in the world who have won the coveted transport pilot's license. She was one of the entrants in the Santa Monica to Cleveland, Women's Air Derby, but was forced out because of illness.

She intends to have an all-woman aerial circus on the formal opening date, and has invited the other transport-licensed women to participate in the gala opening of the world's first "feminine" airport.

This Roof Has Transparent Letters



A NEW construction, known as the Trans-Light Roof, consists of large light transmitting glass areas built in the form of immense letters occupying fifty per cent or more of the entire roof. It makes the name of the airport visible and clearly defined from great heights and distances.

By day the natural reflection of the light of the sky makes the glass letters stand out in sharp relief, as the surrounding roof areas are of dark, non-reflecting material. At night the ordinary electric lighting of the hangar interior, transmitted through the letters, gives a luminous appearance to the identifying name which can be seen at long distances both from the air and from the ground.

Looping the Loop In a Glider

LYMAN VOELPEL has recently established a new loop the loop record for a glider. From a height of 4,000 ft. he cut loose from his tow plane and made 12 loops before landing.

In this same glider he later took up another passenger, who made a parachute jump from the glider at a height of 2,500 ft. This is the first time that such a jump has ever been made from a glider.

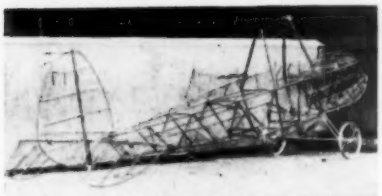
The glider used in these exciting stunts is built exceptionally rigid. It is a Heath Super Soarer and somewhat resembles a regular Heath glider, in that it is a biplane, and of the soarer type.

It is made of steel tubing construction throughout, designed to stand much more strain and hard usage than the ordinary glider would ever get, as can be seen from the accompanying photograph of the stripped fuselage.

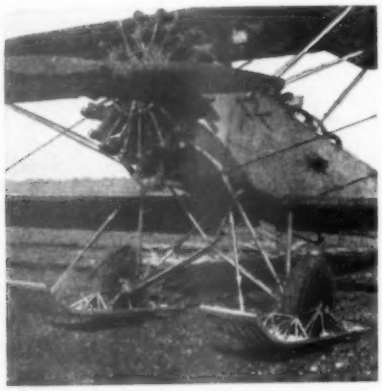
Another unusual feature is, that it is a 2-place glider. This is the only glider of that type in existence today.

The controls are in the front cockpit. For the rear cockpit there is a door on the left side, through which the parachute jumper can easily get out without disturbing the flight of the glider.

The owner plans to tour the country this summer and give similar demonstrations of looping and parachute jumping from his glider.



The Heath biplane glider (skeleton view above) made 12 loops, and also carried an added passenger up 2500 feet for a parachute jump.



Airplane Equipped with Skis

THESE skis enable an airplane to land or take off with equal facility on snow covered or bare ground. This useful contrivance was developed by army engineers at Wright Field, Dayton, Ohio.

The wheels project through openings in the bottoms of the runners. Welded steel tube braces and guy wires provide necessary rigidity.

WANTED

The editor wants information from you as to how you enjoyed this issue. Write a personal letter direct to the editor, or simply indicate your opinions opposite the articles listed on TABLE OF CONTENTS (page 11), tear the page out, and mail it to: The Editor, POPULAR AVIATION, 608 S. Dearborn St., Chicago, Illinois.

A New Way to Ship Airplanes

A NEW method of shipping heavy transport airplanes without crating has just been tried and proved successful.

When the steamship Sorvard of the Garcia Dias line sailed for Spain not long ago, a Ford tri-motored, all metal ship was carried as part of the deck cargo, securely lashed, of course, to prevent its shifting position should the steamer run into heavy weather.

Shipping men consider that the small size of the steamship — The Sorvard is rated at only 3670 gross tons by Lloyd's and is 368 feet long—was one of the main features of the shipment, for it is demonstrated completely that all metal transport planes not only could be carried uncrated as deck load, but that several of them might be nested on the deck of even a small craft.

A tri-motored Ford is being swung aboard ship by a huge crane. It is only partly dismantled and does not require crating.

The transport plane was sent to the Concesionoria de Lineas Aereas Subvencionadas known as the C L A S Air Transport Company. The method of shipment saved $650 on dismantling and carting to the wharf side, for the big plane was towed to the ship and then lightered on board. This saving represents a cut of two-thirds of the former charge for dismantling and towing to the wharf side. Lighterage charges also were cut. But far more important was the saving of approximately $3000 in crating. The crating on a previous job weighed 30,000 pounds, so that the cost of ocean freight has been reduced.

The plane was towed to the wharf on its own landing gear and swung aboard ship by a huge crane mounted on a lighter. An important feature of the Ford plane is the Alclad sheathing, which resists corrosion from salt water, making deck loading reasonably safe, but grease and tarpaulins were resorted to for further protection.

The engines, engine controls and landing gear all remained in place, expediting re-assembly. The wing tips and tail surfaces were removed and stowed in the hold of the ship, without crating.

Upon arrival in Spain, debarkation and re-assembly were greatly speeded up by the new method, which proved so successful that several similar shipments across the North Atlantic have followed. Despite stormy weather, no damage has been reported in any case.

Problems of a Pilot on an

The squadron commander gives final orders to his crack pilots before the take-off from the carrier.

This article vividly portrays the skill and precision necessary for landing on the deck of an airplane carrier. It is based on the personal experience gained by Lt. Webb during his two years' service on the U. S. S. Lexington.

PROBABLY the greatest contrast between flying from an airport ashore and from an aircraft carrier at sea lies in a comparison of available space, the quantities of planes in operation, and the degree of piloting skill required. Everyone is familiar with the large size of the usual landing field and has observed the usual line of planes near the hangars. Space is relatively unlimited and the pilot of an incoming plane has no concern about landing. On the other hand the LEXINGTON and SARATOGA of our Navy, the largest aircraft carriers in existence, operate some eighty odd Naval aircraft of all types, large and small, from a flight deck whose total area is only 2 1/3 acres! Every square foot of this space is used for handling planes and a pilot flying from these ships becomes a master of precision as regards handling his airplane.

Although these carriers are ships of gargantuan proportions and the total deck length is 888 feet, only about 1/3 of that distance is available for landing and a carrier pilot must land and stop fast fighting planes or heavy bombers in less than 300 feet or else crash! Arresting or retarding gear is used to reduce the run of the airplane after landing, but unless the pilot can consistently place his plane with accuracy on a designated spot on the flight deck and can approach at the correct speed, the airplane will not engage the arresting gear correctly and a wreck is the invariable result.

This is no job for an amateur or even for an otherwise experienced pilot who has not received the essential special training to fit him for carrier flying. Landing field technique is of little value for the carrier pilot must land his airplane on a moving ship's deck which, until he crosses the stern, looks about as wide as a shoe string by comparison with the usual landing space ashore. Normally a pilot in landing an airplane uses the surface of the earth or the sea as a reference plane, but on the carrier no such reference is possible for the landing deck width is only about twice the span of a small airplane and is some fifty or more feet above the surface of the sea, which in its turn often causes the carrier to roll and pitch in varying degrees according to the weather.

IN SPITE of these difficulties any pilot of average ability can with suitable training become a successful carrier pilot. Many hours of diligent practice are spent at a nearby flying field until one instinctively executes all the details of a deck landing approach. Finally we are given an official O. K. and told to fly out to the carrier and "do your stuff." Usually there are a number of other embryo carrier pilots who are similarly engaged. We fly out over the ocean for a short distance and locate the ship which is awaiting us, meanwhile trying to remember all that we have been told. We circle the carrier, looking at the landing area with varied emotions, most of us thinking "who said that was a big deck." We see the ship turn into the wind and a white flag appears on the stern. That is the "clear" signal and we turn toward the ship in a preliminary approach slowing our airplane to a reduced flying speed, adjust the stabilizer for the changed speed, jack the seat up for better vision, and come barging "up the groove" hoping we are where we belong. A signal from the deck says we are "fast and high" followed by a "wave off" meaning "don't land, go around again."

The first "passes" are always made for practice when qualifying new pilots in order that each pilot may demonstrate his fitness and familiarity with procedure before making his first landings aboard. Finally we get an "O. K." on our passes and at last the signal says "land aboard." We turn toward the ship with a fervent hope that "this will turn out all right." Up ahead is a narrow deck which we must hit "plumb center" at stalling speed. On one side is the stack and a couple of turrets which appear to assume the dimensions of a skyscraper, the air suddenly gets bumpy near the stern and a cloud of smoke drifts across the course partially obscuring the ship. Just about the time we want to give up and turn away we find the deck close aboard and "we cut the gun." It is too late now to change anything and we cannot

At right, the Lexington at full speed and deck cleared. Below, what the pilot sees from 3000 feet. Not much room to land on, is there?

Aircraft Carrier

By
LIEUT.
L. D. WEBB, U. S. N.

safely turn away, so if our approach has been correct the airplane settles gracefully into the arresting gear and is easily brought to rest with plenty of room to spare. What a "grand and glorious" feeling that is.

HAVING landed aboard for the first time the tendency is to relax a moment and take a long breath, but instead a handling crew appears out of the safety nets*, the airplane is released from the arresting gear and we must taxi clear of the landing area at an astonishing rate in order to get out of the way of the plane which is landing next and is only a few hundred feet away.

We get out of our planes and while the deck crew conducts the inspections which follow each deck landing, the senior air officer of the carrier emphatically points out any errors and afterward sends us out again for several successive landings until finally each pilot demonstrates that he is satisfactory for deck flying. A carrier landing is not unduly hazardous or uncomfortable, but as an initial experience it is a real thrill and is not soon forgotten. Further and continued deck flying serves to eliminate any uncertainty and in a short time each pilot and his plane become a smoothly operating unit in the carrier organization.

It is not always easy to make a good landing on the deck, for the motion of the ship, visibility conditions and the ever present rough air near the stern all contribute their share to the pilot's difficulties. Every landing must be nearly perfect for a deviation of thirty feet to the right or left of the center line, overshooting, landing short, excessive speed or diving for the deck from a high approach are all potential crashes. In spite of all this, major crashes seldom occur and although the Navy's three carriers have been in active operation for several years a deck crash has never resulted in anything more serious than minor cuts or bruises to the occupants of the airplanes concerned.

The carrier flight deck just before launching planes, presents a spectacle which has no parallel on any flying field on earth. Here in a relatively small space are some eighty planes varying in size from single seater fighting planes to huge bombers. Rudders and propellers of successive planes are only inches apart, the wings overlap each other laterally and the deck from above appears to be a solid mass of fuselages and wings. When all engines are running the reverberating roar of the many exhausts is terrific and the deck seems to be covered with whirling propellers. The flight deck at this time is no place for the untrained individual for a single careless step may be his last one. Huge signs everywhere admonish the unwary to "Beware the Propellers."

WE SOON find that our carrier training has just begun. Soon after joining the carrier, all squadrons are taken on board and we sail for the Southern Fleet maneuvers. In the hours preceeding the scheduled time for take off, the squadrons were "spotted" on the deck in the order in which they were to take off in this game of "war".

Finally a signal is received which says "Launch Scouts and search area X." The carrier at once becomes a scene of intense activity. The engines of the foremost squadron are running in an instant, pilots and observers climb into their planes after getting last minute instructions from the squadron commander, who then reports his unit ready for flight. Meanwhile the carrier has been increasing its speed and turns into the wind. What was in the beginning a gentle breeze has been multiplied by the speed of the carrier and is now a howling gale which when further increased by the air stream from many whirling propellers has sufficient velocity in the mid-deck spaces to sweep a man off his feet or to lift an airplane bodily out of its securing blocks. Therefore the planes are lashed to the deck until ready for launching.

We are all ready now and the deck control pilot starts releasing the planes. The leader tails up, rolls a hundred feet or so down the flight deck and is off. As soon as he is clear another is on the way, followed by another and another, only brief seconds apart. Meanwhile our own blocks and lashings have been pulled clear and the plane just ahead is moving away. We are next and as we get the "go" signal we "give it the gun," push the stick forward, roll a short distance straight up the deck and clear the bow with plenty of speed. Sometimes we get thrown around by getting into the slipstream of the preceding plane but usually the take off is smooth and pleasant.

ONCE clear of the deck, the real job begins, for after all, the carrier is only a means to an end, namely to provide a moving base for the air units of our flying fleet.

We have left a moving ship traveling at 25 knots or so, a mere moving speck on the surface of the sea. We must search an area of open sea far ahead of the line of surface ships which form the outer scouting line and which in turn is a considerable distance from the carrier. Our flight will average about four hours, at the end of which time we must return to the carrier, which meanwhile may have moved a hundred miles or so from where it was when we took off.

This is no ordinary straight course, point to point aerial navigation, but is a real problem full of unpleasant possibilities.

The radio is a friend indeed, for as we get out beyond sight of the last of the surface ships an occasional radio

**Life nets alongside the flight deck for the safety of deck crews.*

It is not always easy to make a good landing on a carrier. In this case, the pilot landed badly off center and rolled over the edge of the deck.

compass bearing and the exchange of messages is our only touch with the carrier. Now, we appreciate all those hours of hard plugging in the radio instruction classrooms at Pensacola.

Meanwhile the other scouting planes have scattered and a systematic search is established in the assigned area. Finally the radio flashes "contact" and signals follow giving the location and strength of the "enemy". A scout far off to the right has picked up the "enemy" fleet. The rest of the job is up to the fighting, bombing and torpedo planes which have left the carrier and are now on their way to the attack. Our gas is getting low and so we must return to the carrier. How long have we been out? Have we enough gas left? How many times have we changed course and speed? Has the wind shifted? Is the carrier in the direction we think it is?

A hasty checking of our data on the plotting sheet, a check on the wind with the "drift sight" and we determine a course which should take us back to the carrier. Unfortunately a few tropical rain squalls have started messing things up and the visibility is much reduced. After flying our course for the length of time which should bring us to the ship there is still nothing in sight and so without waiting further we ask for "bearings" by radio. This information when received shows we have passed the carrier slightly to one side, having missed seeing it because of the weather. We get the correct course and a few minutes later we are over the ship, the signals say "land," which we do with alacrity and relief. Fifteen minutes gas supply left! A rather narrow margin, but we are back aboard and that's that.

It is not always as simple as this and in the past there have been many anxious moments and occasionally hours on board the carrier while endeavoring with radio signals and dense clouds of black smoke to guide a lost plane or a lost formation back to the ship. Even with fairly clear atmosphere the tremendous unbroken area of open sea spreading out before the pilot's eyes, serves to reduce an isolated object, such as even the largest of surface ships, to an almost insignificant size, especially when observed from high altitudes. If the carrier is steaming smokeless, (such being the rule) the pilot must have the proverbial "eagle eye" to discern his ship at any distance and if the weather is thick then the possibility of missing the ship becomes almost a certainty. On one memorable occasion a lost pilot eventually picked up the carrier and as he landed on deck his engine stopped, having burned the last drop of fuel!

AFTER an hour or two the rest of the carrier squadrons appear in the sky, having returned from the "attack." Once more the carrier turns into the wind, and now landing operations begin in real earnest. This is not the simple leisurely proceeding which is possible when landing one or two planes, but is a concentrated effort by the pilots and deck crews to get the planes aboard as quickly as possible. The fuel supply of the planes is getting low and the last one to land has to stay in the air until all the rest are aboard, and so speed with safety is necessary.

The order of landing by squadrons is signalled to the formation leaders and when the "clear" signal appears on deck the planes of the first squadron break their formation and prepare to land aboard. In less time than is necessary to tell about it, the first plane is aboard, close behind it in the line of approach is another, and a few hundred feet further back, turning toward the ship is a third. As soon as a plane has stopped it is disengaged from the arresting gear and taxied forward under its own power with its tail in the air, men on the wings to help guide it and all moving on the run until clear of the arresting gear. Meanwhile the following plane lands just as the preceding one is clear and the performance goes on at top speed.

Under these conditions a pilot cannot wait for a clear deck before starting his approach, but must keep coming "in the groove" watching for the red flag to change to white until the very last instant before turning away. Frequently the deck will be cleared just as a plane reaches the stern and so there are no unnecessary delays. This is where real carrier piloting technique shows to advantage. The veteran carrier pilot is never far away from the stern of the ship when he is in the landing circle and he takes advantage of every opportunity to get aboard quickly. Perhaps some less experienced pilot has started a long approach and the deck is clear with no plane ready to land. Some clever pilot will drop into the space, get aboard and be clear of the landing area before the other plane has reached the stern. This sort of flying develops pilots and teamwork. Individually carrier pilots rank among the very best in ability and taken collectively a squadron of these pilots is probably as good an example of teamwork as can be found anywhere.

THE landing of the bombing squadron is usually last and these great airplanes provide many interesting sights as they come aboard. These are huge

Salvaging a cripple after a forced landing in the water. Note the flotation bags referred to in this article.

brutes and as the first plane approaches, one wonders how so many large planes can be handled in the available space, but as each plane lands a surprising sight is seen, for while it is in motion up the deck, men seem to swarm all over the plane; a few hinge pins come out, two jury struts go in and now the great spreading wings fold back into a compact rectangle which conserves space.

During all of this apparently hasty but orderly proceeding a man with a stop watch has been in the nets near the stern recording the time of each landing, the interval between landings and the *(Concluded on Page 82)*

How to Form a Flying Club

By H. A. SPEER

A CLUB plan to be successful must be complete and self-explanatory to the point that it can be turned over to an individual or group of individuals and enable him or them to organize and establish a club on a sound business-like basis with sufficient capital and working material.

There is far more to the successful organization and operation of a flying club than the purchasing of an airplane. It has been proved by experience that an airplane, by itself, will not make a successful club. It must have service and repair, gasoline, oil and hangar space. There must be an instructor and ground school equipment with the incidental equipment including operating and maintenance plans, rules and forms. Proper text-books or home study course and most important, definite financial procedure or regulations should be provided. A maintenance and depreciation reserve fund should be provided whereby funds to meet maintenance costs are accrued in advance and a fund is built up to allow replacement of the Club plane when it has become unserviceable. A known fund is also built to care for necessary repairs and replacement parts. And not the least important, complete insurance should cover the plane in order that each member's investment is protected and to insure the future operation of the club.

Definitely knowing in advance the ends to be accomplished we are building a nation-wide association around a nucleus of clubs already operating successfully under this plan. The association is merely an affiliation of the local clubs each of which retains its identity and answers to the association only in regard that it must abide in its general operating rules and financial program to those outlined by the association. The association makes liberal allowance for local conditions and presumes that local changes will be the rule rather than the exception. Membership of the local clubs of the association may vary from ten to thirty persons and may embrace the following classifications; owner-members, non-owning flying members, and non-owning non-flying associate members. Through a process of training and graduation, members are advanced from one status to another making each club self perpetuating. The major features of this association club plan that predict well for its success are: Complete insurance protection at an unusually low rate, low training and membership-costs and the profit-sharing provision made for each member.

BY A group policy plan, insurance can be obtained on the airplane of each club at a $500.00 yearly premium subject to but minor deductibles. Flying is confined to licensed pilot instructors or those qualified to solo. The protection afforded under the insurance policy for physical damage is as follows: while not in flight, fire, lightning, explosion, windstorm, tornado, and theft, with a deductible of $100.00 on each airplane for windstorm and tornado loss and a deductible of $25.00 for loss by theft. Protection against accidental damage while in flight, landing or take-off with a deductible of $200.00 for each claim.

Protection to cover the legal liability of the club and members against bodily injuries or death of public and the damage of property of others is also given up to the following limits: Public liability limit $5 to $10,000; property damages $1,000.

Passenger liability is furnished at an additional annual premium of $100.00.

The operating costs and cost of membership and training have been compiled solely on the basis of the initial and operating costs of our own plane. Although they are accurate average costs with a small amount added to each to provide for the maximum figures that might be encountered, they are fairly representative and may be used as comparatives.

Membership Costs

Fifteen member club	$273.00 each
Twenty member	$210.00 each
Which includes:	
Training plane	$3,600.00
Insurance	500.00

Operating Costs (Dual Instruction)

Gas	4½ gal. per hr. at 24c per gal.	$1.13
Oil	½pt. per hr. at $1.35 per gal.	.17
Engine	Maintenance and repair	1.00
	Depreciation reserve fund (1200 hr. basis)	1.00
Ship	Maintenance and repair	.50
	Depreciation reserve fund (3,000 hr. basis)	.80
Pilot	Per Hour	4.00
		$8.60
Per member for 10 hr. dual instruction		$86.00

Operating Cost (solo)

Gas and Oil Maintenance and Depreciated reserve fund	$ 4.60
Pilot Per hour	1.00
Per member for 5 hours, solo	28.00
Plus additional solo insurance, per month	6.00
TOTAL	$34.00

This photograph illustrates the necessity of co-operation in glider flying. Members of a German flying club are returning their craft to the crest of the hill in preparation for another flight.

This Heath Parasol Can Be— —

WOULD you believe that the two pictures here are of the same airplane? Fig. 1 is the way the plane looked originally and before it was converted to look as it does in Fig. 2.

The plane in Fig. 1 was a Heath Parasol and is of the high wing monoplane type. The Church Airplane & Manufacturing Company have made a special design to convert the Heath into the mid-wing racing sport type as in Fig. 2. The only changes that are necessary are to lower the center section cabane struts and to raise the turtleback, thus using the same materials throughout. The converted model claims greater speed and efficiency.

Besides the converted design this company also manufactures a Church mid-wing plane which has the same specifications as the converted model Heath Parasol. A few of the specifications are as follows: Height overall 4 feet 10 inches, weight empty 240 pounds, useful load 300 pounds, high speed 90 miles per hour, landing speed 28 miles per hour, with 10 gallons of gasoline its cruising radius is 400 miles. Its price, flyaway, is under $1000.

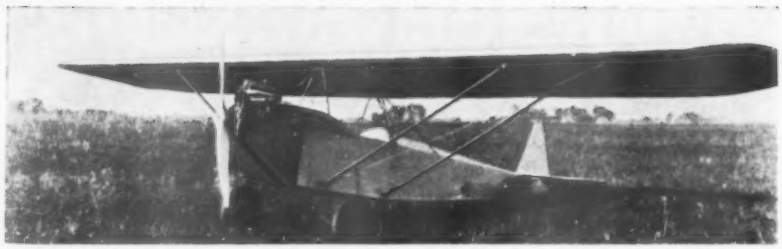


Fig. 1.

Converted into a Church Mid-Wing

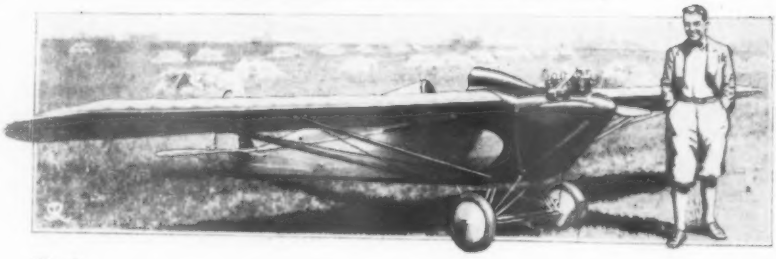


Fig. 2.

Lindbergh's Record As a Flying Student

"JUST a bashful country boy." That was the expression used recently by Lieutenant T. W. Blackburn, Air Corps, an instructor in the Advanced Flying School at Kelly Field, Texas, in describing the Lindbergh of flying cadet days.

Lieutenant Blackburn was a department head at the school while the Lone Eagle was a student, and it was his duty to keep watch on the young man, along with other members of his class, to determine whether or not they had any special qualifications or adeptness for special phases of flying.

A brief synopsis of Lindbergh's record as a soldier-flyer, taken from records of the school, was given as follows:

Attended Advanced Flying School from September 12, 1924 to March 14, 1925; rank: flying cadet, air service; graduated March 14, 1925, as second lieutenant, air corps reserve; age at graduation, twenty-two years; specialized as pursuit pilot; general average: academic, 87.7; expert pistol shot, 85.96; education, graduate Little Falls, Minnesota, High School, 1919; one and one-half years at University of Wisconsin; graduate of Air Corps Primary School, Brooks Field, Texas, September 12, 1924, with 74 flying hours.

After giving the foregoing outline of the student's service, Lieutenant Blackburn enlarged upon the story as follows:

"Lindbergh came to my attention as a student during this latter period of his training. During this time, student aviators are carefully watched by the various department heads (Pursuit, Bombardment, Attack, and Observation) and are earmarked if in their opinion they possess qualifications which would make them promising material for that particular type of flying.

"While there are exceptions to every rule, pursuit flying requires characteristics in the person which, while desirable to other types of flying, are essential to a first rate combat pilot. The primary requisite is, of course, to be able to fly well and shoot accurately. Coupled with this ability he must have an alert mind, to be able to think quickly under emergency, and to act with sound judgment and audacity. All this Lindbergh seemed to possess and I therefore requested his assignment to the pursuit section for specialized training in combat flying. He proved up to expectations. In work which demanded first rate flying and heady action Lindy could always be relied upon to follow through the thickest affray.

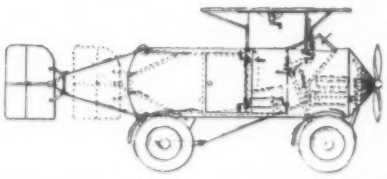
"An incident which is most vivid in my memory is the mid-air collision between him and Lieutenant McAllister, which occured during practice in attacks on Observation types.

"This practice is carried out by making approaches to the two-seater from angles which are masked or 'blind' by reason of the structional features of the plane. Each ship is equipped with automatic camera guns which instead of shooting *(Concluded on Page 75)*

Will This Automobile Fly?

YOU may have thought that someday, somebody would invent and perfect a vehicle that you could drive down the street in, and if traffic got too heavy and you didn't want to stay on the ground, you could just start the propeller, spread your wings, and take off and fly awhile; then come down later and drive on again.

Well, there is now an invention of John Hulin Jr., which claims to do all that. In the accompanying sketch, you may get an idea of how this can be done with Mr. Hulin's automobile-airplane.



This diagram shows the proposed arrangement which will enable the airplane to be converted into the semblance of an automibile.

To quote the inventor, "It can be driven in the city without blocking traffic, as any other automobile. Everything is in reach of the driver, and can be operated without complication. In case of emergency, the driver will be able to fly in a moments notice, and whenever the plane comes to earth, the wings are folded to the sides and the tail is drawn into the body so conveniently that the plane is easily converted into an automobile without getting out, or leaving your seat."

The Thrills of Flying 8 Miles Up

By ANTHONY WAYNE

ALTHOUGH Lieutenant Apollo Soucek went eight miles high, he came down in reasonably good physical shape. He was able to walk. His plane was safe. In this he was more fortunate than other high flying pilots.

There was Major R. W. Schroeder, of the U. S. Army, who had ventured into the higher altitudes. He had used up all his oxygen while trying to find the ceiling of the earth. At 36,000 feet, his life-sustaining substance had been exhausted. He had just set his control for the descent when he noticed this fact. Then he felt what seemed like a terrific explosion in his head, and he fell unconscious. He was at 30,000 feet, almost six miles up.

"My eyes pained me very much," he said after the flight, "and my hearing seemed to be gone. With a great effort I leveled the machine. In a few minutes I was over McCook Field, but my eyes were worse than ever, so I decided that the best thing to do was to gain a little altitude and jump to safety with my parachute and allow the plane to crash."

He did not jump, however. Dazed as he was, his habit of working to save his plane overcame other instincts. He noticed that he was in a familiar region. He had been accustomed to cutting off his engine in about this place and he did so then, although still somewhat dazed. "It was a purely mechanical action," he said later, and he found himself sitting in the cockpit unable to move, with both eyes firmly closed.

When the doctors examined him they found him suffering from an intermittently high fever, with a high pulse and an enlarged heart. These did not last for long, but it required a longer time to regain his normal health.

THE high places have their own secrets. It is not always the climbing to the peaks that hurt so much. It is not infrequently the coming down. The pilot wants to reach earth quickly, but if he is not unconscious from lack of oxygen, he knows that there is great danger from coming down too fast. If he forgets this danger he is in for trouble, loss of muscular power and deafness.

This climbing to the very highest regions brings strange experiences at times. In the cold, clear air, there are strange sights. Lieutenant Harry Johnson and Captain A. W. Stevens,

This is the second of two articles on Altitude Flying.

Three pilots of the 95th pursuit squadron in their arctic clothing ready for high altitude flight in Wasp-powered Boeing fighters.

pilot and photographer, went up over Dayton, Ohio, for 38,000 feet, but could get no higher.

"The ordinary horizon line when flying is between seven and eight thousand feet," they explained. "After we reached above the clouds we couldn't see the ground and the horizon line above must have been at least 50,000 feet, and we didn't know where we were."

At their highest point they found a temperature of 76 degrees below zero. Then they looked below and saw what appeared to be billows of ice crystals, hung in mid-air and resembling the formations of a cave.

The daring aviators described the sight as dazzling, with the light rays broken by the fragile crystals into all the colors of the spectrum. In order to verify this seeming mirage of the heavens they dipped again and again into the crystals, and Lieutenant Johnson, to make even more certain, removed a glove and stuck his bare hand from the cockpit. It was pierced as though by a thousand needles. Not satisfied, Captain Stevens exposed part of his face and for days afterwards he bore a huge ice blister on one cheek as a remembrance.

Dr. Chester A. Reeds, curator of Natural History in New York, says that this strange but beautiful vision of the upper world is made possible because "ice exists in the form of minute needles in the higher atmosphere. From the enormous height at which some clouds float, 30,000 feet, and the low temperature they must consequently encounter, it is impossible that they can consist of water."

"THERE is no doubt that the tiny drops of which they are composed are frozen, and it is on account of the light shining through this bank of minute ice particles that the formation of the beautiful halos is possible."

But there are more dangerous things than beautiful ice caves. Lieutenant Soucek, who went five miles high, found strong winds blowing. An easterly wind of about 200 miles an hour is known to blow constantly out near the rim of our earth. This is the wind that the earth makes in its rotation. At the equator the earth drags the air around with it at the rate of 1,000 miles an hour, but this speed slows up near the poles. It is about 700 miles an hour in middle North America.

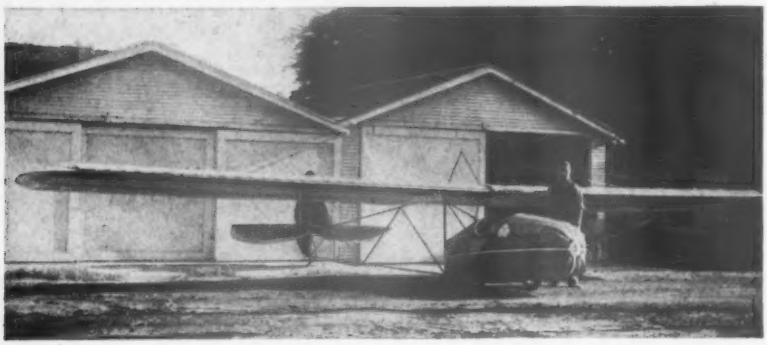
As the air is going with the earth, the velocity is not noticed in the lower strata. At the end, however, where there is nothing to make friction, the air whips with great velocity. One aviator trying for an altitude was blown 200 miles off his course in about an hour and a half. If he had stayed up long enough, and there was cloud strata below obscuring the earth, he might have been in very real danger of descending in the Atlantic Ocean.

The loneliness of these great heights is oppressive. The few clouds that creep by in the various levels are like icy ghosts of another world. Sometimes a snowstorm is encountered, the snow coming from nowhere and never reaching the ground, as the flakes turn into cloud mists thousands of feet below. Flying through snowstorms in July or August is not an uncomfortable experience to aviators who search the higher worlds.

THE flash of the propeller blade, the up and down dance of the rocker arms on the engine, the snowy coil of frozen gas from the exhaust pipes and the quiver of the slim white hands on the instrument dials are the only movements that an aviator sees when he goes so high. He lives in his machine. It is the only living thing in a great silent space. There is not enough air to hurl echoes back even if the sound reached anything.

In that unknown place the aviator must even watch his own mind. He must check his own thoughts. If he delays in taking his oxygen or runs out or takes too *(Continued on Page 62)*

A New Enclosed Cockpit Type Glider



The "Skysport" was designed by Ward Braley, aged 18, who is standing beside his finished glider.

THIS advanced type glider, pictured here, the "Skysport," made by the Braley Glider Corp., has several unusual and new features. In the first place you are immediately impressed by its finished and refined appearance.

The entire front end of the glider, and extending to the back of the pilot's seat, is covered with fabric thus giving the glider a streamlined appearance as well as giving the pilot a protected cockpit. This is the first glider of such construction or appearance. It is thus both a secondary type soarer and a primary type glider in one. Instead of the ordinary skid that most gliders use, the "Skysport" is equipped with a landing gear and wheels, and also with a spring tail skid. This helps greatly in taking off and eliminates danger in landing, besides making landing much more comfortable for the pilot.

The length of this glider is 21 feet 2 inches; its height is 6 feet; its weight is 156 pounds; and its landing speed is 10 miles per hour.

The fuselage is constructed entirely of welded aircraft steel tubing. The wings are of spruce and birch plywood box spars; spruce and mahogany plywood ribs, fabric covered.

It is interesting to know that it was designed by Ward Braley, who is only 18 years of age. He made an advance estimate of its weight of 156 pounds, and the finished craft came within half a pound of his estimate.

Trying to Hide in an Airplane

LAST summer, while barn-storming, Florin Johnson, one of the pilots who has helped make aviation history on the stubble fields of the west was attempting to find a small town, away out in the sticks, that he had never visited before. Gliding down low over a farmer who was plowing in a field he yelled at the top of his voice: "Hey! where am I?"

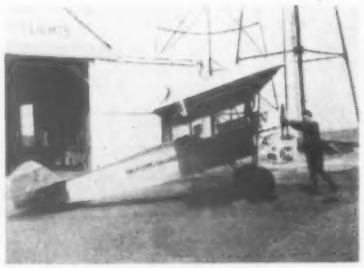
The farmer looked astounded for a minute, then with evident glee answered: "Yu can't fool me, yer hidin' up there in that blankety blank airyplane."

It Is Important to Inspect Landing Gear

WHILE the landing wheels and chassis take no direct part in flight yet they are mighty important members of the assembly. A great many accidents have resulted from loose landing gears, lost wheels or flat tires, hence a very thorough examination should be made before every flight. Nails, and other sharp metal pieces frequently found on the floors of hangars, are often the cause of landing crashes for airplane tires are no more immune from punctures than any other tire.

Announcement

We are very pleased to announce to our readers that arrangements have been made with the Storms Airplane Co. for the release of complete plans and instructions for building the "Storms Flying Flivver." As soon as the series of construction articles for the Rhon Primary Glider are completed, we will begin the series on the Storms plane.



The Storms Flying Flivver

Why Air Trips Are Rough

THE difference between the rough and the smooth trip is caused by the general trend of the wind. In a moderate tail wind the plane will ride smoothly, especially at a reasonably high altitude, and vice versa. If there is a head wind of any great velocity or a stiff cross wind, the trip is more or less rough. In the case of a rough trip, the pilot may fly at several different altitudes until he reaches one where the plane rides smoothest.

In the case of the tail wind, he will pick the most favorable wind to help him—which may be anywhere from 1500 to 10,000 feet. An elevation of 1500 feet is considered a very safe altitude at which to fly, especially with a tri-motored plane. The pilot's one aim is to make your trip as comfortable and pleasant as he can even though it may require a few minutes longer to climb the ship to a suitable elevation where it will ride best.

Lt. Selff Nearly Freezes on Desert

FREEZING on a desert is a rather unusual bit of news, since one is accustomed to associating a desert with climate where the mercury hits the high places. Nevertheless, this was the experience recently of Lieutenant Robert E. Selff, U. S. Army Air Corps pilot of Rockwell Field, California.

The army airman took off from Rockwell Field with San Francisco as his destination. Everything was going smoothly until he ran into thick mist. Rising above the blanketing fog as best he could, Lieutenant Selff made out the outline of what he took to be Mount Diablo, near San Francisco. Attempting to circle about the peak, he found no familiar land-marks and realized he was off his bearings.

Meanwhile the gas tank recorded only a half hour of flight left in his ship. Near the end of those precious thirty minutes the aviator sighted what seemed to be a dry lake bed. This stretch of ground had an unusual shine to it, and the man did not know whether or not there was water there.

Selff then tried a trick new to aviation. He swooped down over the bed, pulled his stick back, and let his tail skid just touch the surface. Dust flew up. He knew then that it was dry land, circled about, returned and made the landing.

His altimeter registered 6000 feet and the aviator soon realized that he was adrift on a lonely stretch of desert country. Moreover, it was growing colder every minute as dusk began to settle.

The useless plane was pointed into the sun as a direction finder and Selff gathered wood and built a fire to attract attention. Night fell and the man donned all the clothing that he could gather, including the canvass 'chute envelope.

But even *(Concluded on Page 76)*

Pusher Type Planes Are Back in Style

By JOHN B. RATHBUN

The Northrup flying wing is a recent successful development of the pusher type plane in this country. It will be developed into multi-motored transport planes, according to projected plans.

WE HAVE seen so many tractor airplanes during the past few years, in fact they have held the field almost exclusively, that the present generation has little or no knowledge of the "pusher" with the propeller behind the wings. Very recently, however, a considerable amount of experimenting with an all-metal pusher has been conducted in California which is certain to be of interest to the aviation industry in more ways than one. This pusher monoplane, like all other pushers, has certain inherent advantages not possessed by the tractor which will be apparent to everyone after a little study.

During the first year or so of the war, many pushers were employed by the French and English Army, the Farman and the Voisin being two of the most prominent examples. However, it was soon found that the pusher did not yield itself to war-time conditions as well as the tractor, for the field of fire at the rear was obstructed by the propeller and by the frame of the outrigger employed at that time, and finally the pusher was discarded. After the war, the market was deluged with old government tractors, and as a result, the tractor habit grew on the public who by this time hardly knew of any other type. Thus, a machine with purely military advantages has been upheld long after its age of usefulness has passed, a habit that is not unusual in other lines as well as with tractors and pushers.

In the accompanying photograph and line diagram we show the leading features of a pusher type monoplane. Instead of the usual long tapering fuselage, we have a short stubby body provided for the pilot and passenagers called the "nacelle," with the tail surfaces carried at the rear by two long tapering "tail booms" in such a way that room is left between the booms for the revolutions of the propeller. The propeller is mounted at the rear of the nacelle with the engine located in a position determined by the engine type, whether water-cooled or air-cooled. It will be noted that the slip-stream (p) from the propeller is practically unobstructed by anything outside of the tail surfaces, and that even the tail surfaces are so far removed from the propeller that little resistance is offered to the slip-stream.

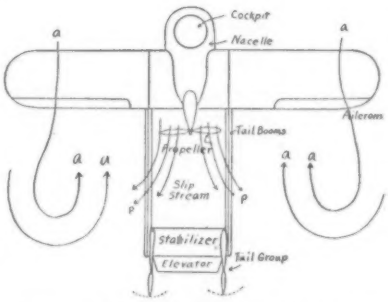
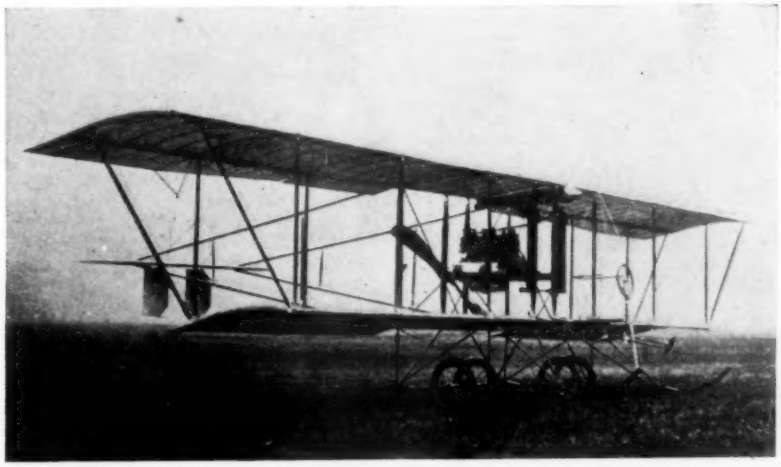


Diagram of the important features of the pusher type plane.

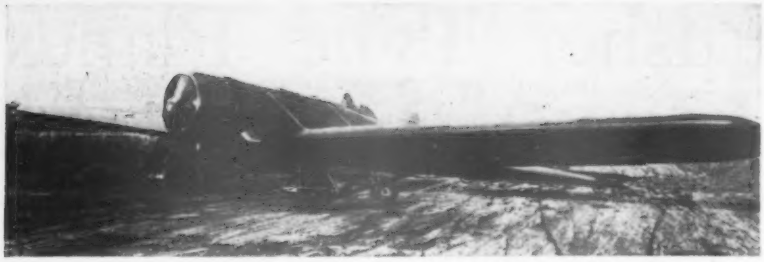
ONE of the most striking advantages from the standpoint of the pilot and passenger is the fact that there is no obstruction in the front to restrict their field of vision in this direction. The mounting of the engine and propeller in the nose of a tractor type is a decided disadvantage from this point of view. Again, the high velocity slip-stream, the spray of lubricating oil and the gases issuing from the engine are swept to the rear and away from the nacelle while in the tractor type they cause considerable annoyance and dirt. Critical passengers of the future will demand a clear field of view and the other advantages offered only by a pusher.

For many years, the stock argument against the pusher type has been the alleged loss of propeller efficiency due to the propeller "working in the disturbed air" swept down by the wings. If the wings rotated the stream of air to any appreciable extent there might be something in the argument, but as a matter of fact, the air is swept down along practically straight lines so far as the propeller is concerned. These critics neglect to point out that the rotating spiral of air directed by a tractor propeller on the wings very materially reduces the lift on the wing located under the down coming blades, and they also neglect to mention the gain of energy due to the propeller being located in the "wash" of the wings so that the matter of efficiency is rather in favor of the pusher than against it.

It is a well known fact that the propellers of steam ships are invariably located at the rear of the ship and this is for a very good reason. The fluid friction of *(Continued on Page 78)*



A pusher type of airplane with 50 h. p. motor which was very popular for exhibition flying in 1912. This type of plane with Pilot's nacelle added was used by the British in the early days of the war.



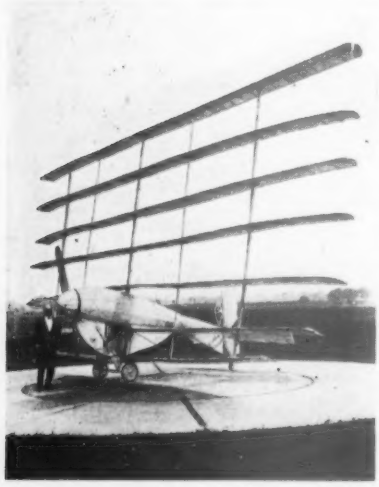
Special Plane to Cross Pacific

CHARLES ROCHEVILLE, veteran pilot, is shown in the cockpit of the low-wing monoplane in which he hopes to make the first Japan-to-America flight next month. The plane, constructed at a cost of $50,000, is powered with a 300 h. p. motor and has a gasoline capacity of 875 gallons, carried in the wings and fuselage. It has been tested successfully. Prior to this trans-Pacific hop, Rocheville will make a final test of his ship at Los Angeles, Calif. soon in an endurance non-refueling flight. If the flight is successful, the plane will be shipped to Tokio. The American destination of the ocean hop will be Seattle, Wash.

An Airplane to Be Flown with Bicycle Pedals

THIS peculiar looking contraption is called a "cycleplane." It was invented and actually test flown by W. F. Gerhardt, an aeronautical engineer of Dayton, Ohio.

It operates by footpower and Mr. Gerhardt claims to be the first man to rise from the ground in a flight by a machine using only the motive power supplied by the pilot's muscle. He calls his machine a "scientific curiosity."



The multiple wing surfaces are intended to provide added lift. No power plant is used, the pilot providing his own foot-power.

Gee Bee Lightplane in Production

A NEW type of biplane, that has been termed "fool-proof" because it is so easy to handle and get out of trouble in the air, has been perfected by Zantford D. Granville of Springfield, Mass., and will soon be turned out in factory quantity production. It is known as the Gee Bee plane, and has a cruising radius of 450 miles, a cruising speed of 95 miles per hour and a top speed of 107 miles per hour. It has a single two-place cockpit and dual controls. Its upper wing span is 29 feet, lower wing span 25 feet, four inches, and its overall length is twenty feet, four inches. It stands seven feet, eight inches high, and weighs 1050 pounds empty and 1650 pounds with full "pay load."

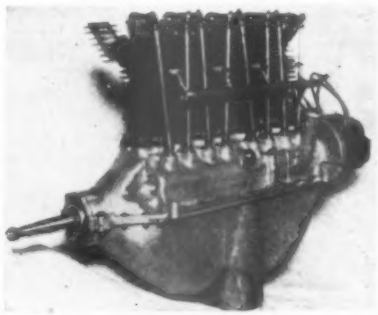
One of the unusual features of the Gee Bee plane is its control stick, which projects horizontally from beneath the instrument board, instead of upright from the floor of the cockpit. This arrangement gives greater leg room and leaves the cockpit clear. Moving the stick to right or left operates the ailerons, while a push-pull motion operates the elevators. Instead of a bar to operate the rudder, which is also dual, pedals similar to those of an automobile for the brake and clutch of the car are used. All dual controls are folded back out of sight when not in use, and the plane becomes a single pilot machine. The dual throttle is made inoperative by a ninety degree turn of the hand. Dual controls can instantly be released by two very simple motions while the plane is in the air, and a twist of the main stick renders the dual stick ineffective.

The plane is braked for landing, the brake lever being located in the stick assembly and controlled by pulling the stick out past the position for a landing, or by pressing a trigger in the pistol grip of the stick. When the brakes are set the distribution of the braking force between the right and left wheels is automatically controlled by the rudder pedals, just as the driver of an automobile can bear down or ease up on his foot brake and clutch. Ground looping can be prevented by using the opposite rudder. A seven inch shock absorber prevents the plane from bouncing on a poor landing unless the pilot hits the ground at flying speed, and while taxiing or rolling over rough ground the plane remains steady. Landing speed is 39 miles an hour.

Converted Ford Motor on Market

TWO mechanical engineers of Dayton, Ohio, have designed an aviation motor from the reliable Model "A" Ford Motor. This motor was selected as tests had shown it to be light, well designed and sturdy. The material used was the best that up to date engineering and unlimited resources could provide. Also the fact of reasonable price and national distribution of replacement parts, made the use of this motor's parts particularly desirable.

Several design lay-outs were made to determine the best possible arrangements and adaptions of the standard parts: from these designs one was selected which seemed the best to use and detailed drawings, patterns and machined parts were constructed.



All parts were machined by the best tool makers, and jigs and fixtures were used to insure interchangability of parts even in the first motor. When this motor was put on test the results obtained were well worth the extra work involved.

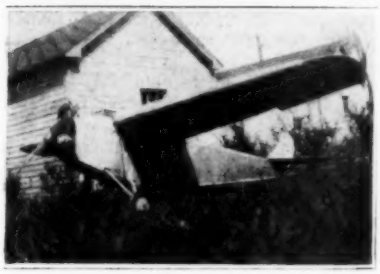
The cylinder and valve action had been designed for 60 H. P. at 2500 RPM and it was found that tnis power was developed with the use of a standard Stromberg aviation carburetor. The motor developed 52 H. P. at 2500 RPM using the regular Ford carburetor which is satisfactory for low altitudes. As the finished motor, dry, only weighs 173 pounds with two magnetos, it was felt that a good start had been made.

As the Ford crankshaft is not drilled for oil pressure it was necessary to take steps to provide for pressure lubrication. This was done by drilling at proper places and then plugging all external holes. The crankshaft was then carefully checked for balance on a machine especially built for this purpose. The crankshaft extension was designed to accommodate the propeller hub and end thrust bearing and was then rigidly bolted to the crankshaft flange.

The Ford Model "A" camshaft was next given consideration and it was found that it would not be necessary to make any changes. As the rise of the cams would not give needed valve lift, it was necessary to use a special rocker arm with increased lift ratio. A Nash rocker arm *(Concluded on Page 85)*

XUM

A Flying Model That Must Be Tied Down



Left, the Wall one-cylinder gas motor for models. Right, the Fokker model that is wired to a post and is left to fly in circles.

WHAT would you think of a flying model that flew so well that it had to be tied down? That is the case of the nearly perfect flying model built by Mr. H. N. Hartman of Chicago. His model as pictured here is an exact scale model of a Fokker Super Universal. It has a wing span of 6 feet and one inch. The fuselage is constructed entirely of metal and the wing is of metal and fabric.

It is powered with a real gasoline engine, which was built up from "Wall" castings. The spark for the ignition system is furnished by an ordinary dry cell battery. The fuselage of the model is so constructed that the battery will fit in it. In this form the model weighs 10 lbs. When the plane is flown with the battery mounted in it, it is necessary to put only a small amount of gas in its 6 oz. tank for with a tank full of gas the plane would fly out of sight.

Even when there is but a small amount of gas in the tank there is danger of losing the plane, so the owner has devised a plan whereby he can fasten a wire to the plane and the other end of the wire to a post, thus allowing the plane to fly around in a circle. When it is flown in this manner, the battery is not put in the fuselage. The wire which runs to the plane and also holds it down carries the spark to the motor.

The motor in itself is quite a striking piece of mechanism. It is a single cylinder, two-cycle, air-cooled motor. It has a bore and stroke of 1¼ in. x 1¼. It weighs a few ounces less than 2 lbs. and develops ½ h. p. at 3,000 R. P. M. The method of lubrication is very simple, oil being mixed with the gas at a 15 to 1 ratio, making lubrication automatic while the engine is running. All in all, the Wall Model Engine, although quite simple is not at all crude. It has many features of regular full sized gasoline engines. For example, it has a duplex exhaust and it also has a double jet carburetor, which on the most recent models is placed behind the cylinder and cuts down wind resistance considerably.

Flying with a Motor and a Parachute

HENRY BUSHMEYER, professional parachute jumper, has built a two-cylinder motor and prop which he intends to demonstrate in a "directed parachute jump." The 7 H. P. motor, 4-foot prop, 2 batteries, 1 quart of gasoline and a steel-and-board framework will be attached to his chest and back. Heretofore the parachute jumper must trust to the winds, but with the new device Mr. Bushmeyer expects to direct his flight—of perhaps 20 miles distance—by holding out a hand in the slipstream from the motor. The plan is to jump from a plane some Sunday and when the 'chute opens, start the auxiliary motor and fly to earth.

Since this news item was prepared for publication, we learn with regret of the death of Mr. Bushmeyer. Although he made over 500 successful jumps with a parachute, he was not wearing a 'chute when the accident occurred that caused his death.

—Ed.

Why Women Take Up Flying

EVERY woman pilot and flying student has at one time or another been asked one certain question. And here is a miscellaneous collection of bona fide answers from women pilots—transport, limited commerical and private—and from women fledgeling aviators to the question:

How did you happen to take up flying?

Because it is much more fun than golf, or tennis, or swimming or any other sport—I've tried them all and I know.

Because flying has always fascinated me. When I saw my first plane at the age of four, I told my father I was going to buy one myself when I grew up and made a million dollars.

Because it is the most interesting way to make a living in this day and time.

Because flying is the fastest way to go places.

Because it is good for an inferiority complex.

And, conversely, from still another point of view, because it is good for a Narcissus complex. You can't maintain a "look at me, I'm somebody" attitude long and amount to shucks as a pilot.

Because flying takes you out into the fresh air.

Because I fell in love with an aviator.

Because, well simply because Lindbergh flew the Atlantic.

Because you get on speaking terms with the sky, and the wind —and—*say* did you ever fly at night?

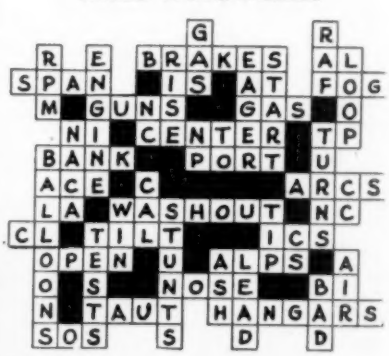
Because there are so many interesting people in aviation.

Because my brother bet me I couldn't learn.

Because it's a good clean sport.

Because—because—well just because it's more fun than anything else in the world.

Solution to Last Month's Cross Word Puzzle



Erratum:—
The word "span" was incorrectly defined last month. The span of wing is its length; the chord is its width.

The Plane with Robot Eyes

HOW an operator in a chamber full of wires, mirrors, and strange instruments will "project" himself through the air—he himself never leaving the chair in which he sits—is a new miracle of science which is now being discussed by the experts of a commission the French Government has established to study the problem of manless air machines.

An operator on the ground, seated before switches and levers, will "fly" this weird machine by wireless exactly as though he were aloft. When he shifts one of his controls the Robot on high will obey, precisely as though a human hand made the requisite movement in the cockpit. And experts now affirm that, not only will the man on the ground be able to do things, but that he will also be able to see things, miles distance from the controls.

The "eyes" of the Robot, acting as lenses, will, as it flies, focus on television cells within its body a picture of all that lies in the vicinity—everything above and below, in front and behind, or on either side. And all that the machine thus "sees" will be flashed back by wireless and reproduced upon screens in the control station.

Fernic Monoplane Designed for Trans-Atlantic Flight

A NEW monoplane designed for a trans-Atlantic flight from New York to Bucharest, Roumania, was recently taken to Roosevelt Field, Long Island, N. Y. for exhaustive flying tests.

This plane has been in the course of construction for more than a year and has cost $80,000 to build according to George G. Fernic, vice-president and general manager of the corporation, who will pilot the ship on it's proposed trip.

The Fernic monoplane differs from any others in two major points. The first difference is noted in the use of two monoplane wings set tandem and the second is the tricycle landing gear arrangement composed of three wheels in a group at the forward part of the ship. In addition, the tail assembly carries a steel spring-leaf tail skid as an extra safety device in case of a bumpy landing. However, it is proposed to make the regulation three-point landing on the three forward wheels.

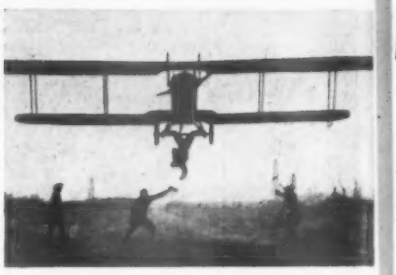
According to present plans, it is proposed to land the Fernic monoplane in a slightly stalled position just as other ships are placed for settling down, but instead of the stall being completed and the tail skid settling down with the wheels, the forward wheel is designed to take the load on the shock absorbers built into the nose of the ship. This wheel is designed to act as a large castor, similar to those used on furniture.

The arc of the castor from right to left is controlled by conventional airplane elastic shock absorber cord. When either of the brakes on the right or left wheels are applied to turn the ship on the ground in taxing, the nose of the ship is designed to swing on the front castor.

The use of monoplane wings in tandem gives unusual characteristics but not unlike those of the old Henri Farman shorthorn of 1912. However, no ships of the present day are thus built. While slotted wings have been designed to reduce stalling, it is claimed that the action of the tandem wings actually impedes the stall.

The forward wing is much narrower than the main plane and is set at such an angle of incidence that it reaches its stalling position four degrees before the main wing has reached such a point. When this "bubble" point, about sixteen degrees, has been reached by the forward wing, its airstream is deflected upon the main aerofoil, giving the latter even greater lifting power than before and causing the front wing to drop back to its natural position by rea- *(Concluded on Page 75)*

The Fernic monoplane was built at a cost of $80,000, and designed to make a non-stop flight from New York City to Bucharest, Roumania.



Playing with Death

SOME stunts are even more death defying than others and this seems to be the limit in playing with death. The slightest false judgment on the part of the pilot of the plane, and the man swinging below would be dashed against the ground without the slightest possibility of saving himself. They were doing this just for the fun of it, too. The man holding the hat for the other to catch is taking a few chances of his own.

New Ryan Foursome

THE new Ryan foursome anticipates the requirements of the most fastidious. The seats fold down to form a comfortable bed for the air traveler, and the cabin is equipped with cigarette cases, ash trays, window curtains, non-shatterable glass, cabin heater, and upholstery of a unique design.

Eight States Require No Flying License

UNDER the air commerce act, all airmen and planes engaged in interstate commerce are obliged to have federal licenses. However, there are still eight states that require no licenses at all and within these states there are many rejected pilots and planes flying with total disregard for the safety standards so carefully established by the government. It is necessary, for the good of aviation at large, that uniform laws be established in all states so that there will be conformity and a lack of the confusion that has existed for so many years in the application and enforcement of automobile laws. It is to be hoped that the state officials of the various states will come to an agreement on a common code before the present uncertainty has become a settled habit.

Alexander Klemin
Professor of Aerodynamics,
College of Engineering, New York University

Article 21 *(Conclusion of the Series)*

Resistance of Parts and Resistance of a Complete Airplane, Part II

AERODYNAMICS

Cowling in of the Engine

MUCH attention has been given of late to special cowling in of the engine. Both wind tunnel and flight tests indicate that much saving in resistance and improvement in performance is possible. With care, the cooling of the engine need not be impaired. As an alternative to the N. A. C. A. or Venturi Cowling, the Townend ring (see Figure 13) is sometimes employed. While not quite so

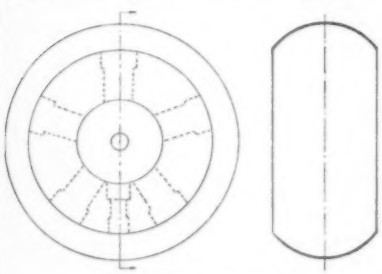


Fig. 13. Townend Ring.

effective in reducing drag as the Venturi Cowling, it is nevertheless very helpful, is much simpler to make and hinders the pilot's vision much less.

The following is an elementary and qualitative theory of the Venturi Cowling as illustrated in Figure 14 (a).

When the cowling leaves the cylinders exposed, the shape of the nose and the projection of the cylinders cause the airflow to leave the surface of the fuselage. When the Venturi Cowling is applied (as in Figure 14 (b)) the flow is smoothed out and the air is made to follow the contour of the fuselage.

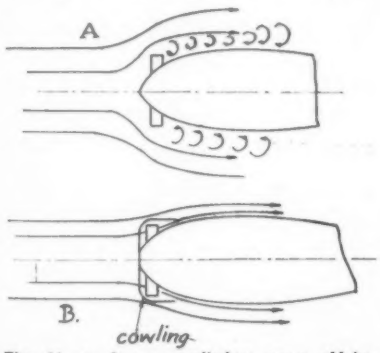


Fig. 14. a. Exhaust cylinders cause eddying flow over fuselage and high drag. b. Cowled cylinders smooth out flow and reduce drag.

Resistance of Free Air Radiators

Where a nose radiator is employed, with the engine in back of the radiator, it is very difficult to give rules for the increase in radiator resistance due to the fuselage.

Where a free air radiator is employed, a resistance co-efficient of .0026 pounds per square foot of normal area per mile per hour is quite reasonable.

Tail Surfaces

For estimating tail surfaces resistance, the Army Air Corps recommends a figure of .00006 pound per square foot of surface per mile per hour. This co-efficient takes care of tail plane, brace wires and struts.

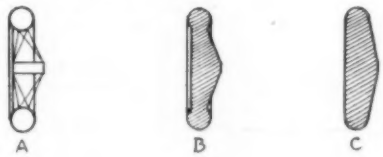
Resistance of Wheels

The values employed by the Army Air Corps for computing the resistance of wheels are given in Figure 15.

An Example of Resistance Estimation

IN FIGURE 16 is shown the design of August Zinnser, Jr. which won the Wright Aeronautical Corporation's 1929 Design Prize for aeronautical students at New York University.

The estimate of Parasite Drag and Horse-Power Required was obtained by means of tables I and II.



Tire Size	A Bare Wheel	B Usual Fairing	C Full Fairing
20 x 2	.00061	.000406	.000203
26 x 3	.00108	.00072	.000360
28 x 4	.001410	.00094	.000470
30 x 5	.001815	.001210	.000605
32 x 6	.002285	.001525	.000761
36 x 8	.003380	.002250	.001125
44 x 10	.005120	.003410	.001705
54 x 12	.007590	.005060	.00253

Fig. 15

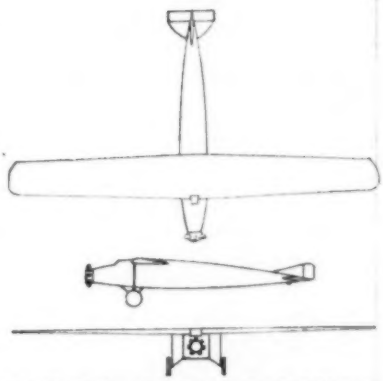


Fig. 16. Design of A. Zinnser Jr., Wright Aeronautical Design Competition.

From the known characteristics of the airfoil and the above Parasite Drag data, the horse-power required curves of Figure 17 were obtained.

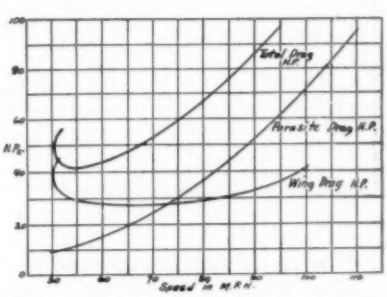


Fig. 17. Drag and power required curves for high monoplane designed by A. Zinnser, Jr.

The most striking lesson to be derived from these curves is the importance of the parasite drag at high speeds. At 73.2 miles per hour the parasite horse-power curve crosses the wing horse-power curve, and thereafter increases at a much more rapid rate than the wing horse-power.

This is quite a typical condition and indicates that for high speed performance, reduction in parasite drag is likely to be a much more important factor than improvement in airfoil design. A confirmation of this statement is also to be found in the fact that the parasite drag at 1 mile per hour is greater than the minimum wing drag on a basis of 1 mile per hour.

Part	No.	Size	Coef.	Drag at 1 mph
Fuselage	1	Cross Sectional Area=15.6 sq. ft. D=Kx AV² A=15.6 V=1	Kx=.000753 lbs/ft²/mph	.011740
Front Struts	2	Assume F. R.=3 with fairing D per ft.=K x d″ x V² D=2.5″ L=3.5 (projected) -|-3.0 for two end fittings=6.5′	K=.0000183 lbs/ft²/mph	.000460
Rear Struts	2	Assume F. R.=3 with fairing D per ft.=K x D″ x V² D-2.5 L=4.0 (projected) -|-3.0 for two end fittings=7.0′	K=.000183 lbs/ft/mph	.000460
Shock Absorber Struts	2	Assume F. R.=3.5 with fairing D per ft.=K x D″ x V² D=2.5″ L=3.0′ (projected) -|-3.0′ for two end fittings =6.0′	K=.000183 lbs/ft/mph	.000540
Shock Absorber Unit	2	Assume F. R. = 2.5 with fairings D=3.5′ L=3.0′ no end fittings	K=.0000194 lbs/ft/mph	.000270
Wheels	2	30″ x 5″	D=.000605 lbs/mph	.001210
Tail Surfaces		Area 36 sq. ft.	K=.00006 lbs/ft²	.00216
Tail wheel and support		Approximated		.0003
Control horn lights and exhaust	4	Approximated	.0010 lbs/mph	.0040 .0032
				.024560
Interference of Parts		Add 10%		.002456 .027016

TABLE I Zinnser's Design Parasite Drag

It is also interesting to see what a large proportion the landing gear drag bears to the fuselage drag namely 26.9%. The use of a retracible landing gear is evidently well worth while.

IT WILL be noted that Mr. Zinnser in making his computations neglected the effect of slipstream.

To correct for slipstream, the following procedure is followed:

(a) The thrust of the propeller at any speed is obtained either from wind tunnel tests or by calculation, or from conventional propeller characteristic curves.

(b) The thrust of the propeller is equated to the momentum imparted to the air per second as it passes through the circular area swept out by the propeller, and hence the slipstream velocity is found.

(c) If V is the speed of the airplane and v is the extra velocity imparted to the air as it passes through the propeller disk area, then the resistance of any part in the slipstream is multiplied by the ratio $(V\text{-}|\text{-}v)^2$

V	V³	K V³	H. P.
40	64000	1729	4.61
50	125000	3378	9.00
60	216000	5835	15.56
70	343000	9262	24.70
80	512000	13830	36.89
90	729000	19700	52.54
100	1000000	27016	72.00
110	1331000	35860	95.60
120	1728000	46690	124.40

TABLE II H. P. Required by Parasite Drag

$$HP = \frac{KV^3}{375}$$

However, many designers are of the opinion that the error in neglecting slipstream effects is negligible and this view if substantiated by some wind tunnel tests. It is true that the slipstream increases the parasite resistance. But at the same time the presence of resistance producing objects behind the propeller, retards the speed. One factor entering into the efficiency of the propeller is the ratio $\frac{V}{V\text{-}|\text{-}v}$ and increase in this ratio improves the efficiency of the propeller as compared with its efficiency in free air. One effect counter balances the other.

Possibilities of Parasite Drag Reduction

THE study of airplane parasite drag is one on which much attention is being concentrated at the moment, both in the wind tunnel and in full flight work. Space will not permit us to go into details, but the following suggestions may perhaps help the reader in his further studies or experiments:

1. Improvement and simplification of the cowling of the radial air-cooled engine both when placed in the nose of a fuselage, and on the wings. The Townend ring, because of its simplicity is particularly interesting.

2. Improvement in the cowling of in-line air-cooled engines. An obvious line of attack is to cowl the engine in almost completely, with the smallest opening or scoop at the front end, and then to guide the air by vanes inside the cowling so as to give each cylinder the proper amount of air for cooling.

3. Improvement in the interference between engines, nacelles and wing, in outboard engines. The wing is particularly sensitive to disturbances at or above its upper surface. Air-cooled engines placed in nacelles only a little distance above the wing, bring down the Lift/drag ratio far more than would appear to be the case were the drag of the wing and the drag of the engine and nacelle simply added together. A great deal of work remains to be done in reducing interference, whether by placing the nacelle well above the wing, or by placing the nacelle below the wing, or by putting the nacelle at the leading edge of the wing with such careful cowling and streamlining that the nacelle becomes an integral part of the wing. (See Figure 18.)

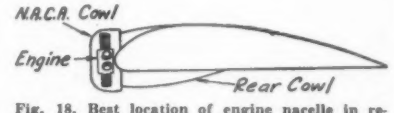


Fig. 18. Best location of engine nacelle in relation to wing.

4. Employment of cantilever monoplane wing, skillfully tapered in both plan and thickness, so as to provide width of chord and depth at the root. With such *(Concluded on Page 72)*

New German Plane Has Side-By-Side Seating

A CABIN type sport monoplane and trainer called the "Ace of Clubs" has recently been marketed in Germany. The passenger and pilot or (pilot and student) sit side-by-side in an enclosed cabin provided with large cellon panels that give an excellent range of vision. At the rear of the cabin is a luggage compartment separated from the cabin by a zipper-fastened tarpaulin. There is adequate protection against the wind and engine exhaust so that the pilot and his passenger can converse easily.

It is powered with the new four-cylinder, air-cooled in-line, inverted Argus engine, with a maximum output of 80 H. P. This gives a power loading of 8.37 kilograms (18.4 Lbs.) per horsepower and a cruising speed of 160 kilometers per hour (96. M. P. H.) The radius is 500 kilometers (300 miles) under standard conditions.

It is claimed that the machine can carry a total disposable load of 350 kilograms (770 Lbs.) including the weight of the pilot, passengers, fuel and luggage. The empty weight is 405 kilograms 891 Lbs.), which with a wing area of 160 square feet, gives a wing loading of approximately 9.1 pounds per square foot. The span is about 33 feet.

Buffalo Has Police Air Squad

BUFFALO, New York, now has a police aerial squad. It is composed of nine volunteer aviators, designed to put fear into the hearts of both law-breaking fliers and fleeing criminals.

New York State has a law prohibiting low and stunt flying, and these flying cops will enforce this law, and will try to catch up with criminals who have swept through the police net and are well on the way to safety along country highways. Most of the squad members are now on duty during all daylight hours.

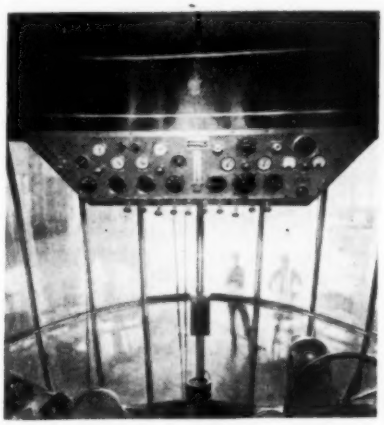
The aviator policemen will be armed, and in their planes they will carry tear gas bombs and other equipment. The men have been sworn in by Police Commissioner Austin J. Roche and are empowered to stop any planes or automobiles.

Life-Like Model

NO, IT'S not a real airplane, but a model of a new Spartan C-3-225, used by the aviation sales department of Skelly Oil Company, Tulsa, Oklahoma.

The model was constructed at the Spartan factory by workmen during spare time. It has a wing spread of 4 feet and an overall length of 3 feet, 4-5/16 inches. The plane is constructed of wood and metal throughout and is equipped with an electric motor which turns the propeller at a rapid rate.

It looks exactly like a Spartan, but it is really only a model constructed identically to scale.



Goodyear Blimp Has Complicated Instrument Board

OUR readers will, no doubt, be very much interested in this unusual photograph of the instrument board of the Goodyear blimp "Mayflower."

A lighter-than-air-craft looks so simple to operate from the outside. The blimp pilot, however, has his hands full to handle his floating helium bag, as can be readily seen from this view of the many instruments he must watch.

Sending Photos to Planes in Flight

During the recent army maneuvers, an observation plane discovered enemy submarines near Frisco Harbor, and radioed this map to ground headquarters.

THE practicability of sending pictures by radio to airplanes in flight was successfully demonstrated not long ago in Germany; and, as a result, the Deutsche Luft Hansa is seriously contemplating making use of this graphic means of communication in connection with its long distance airways. For the tests, one of the company's planes was equipped with a Telefunken receiving set designed especially for airplane service.

The Berlin radio station transmitted the pictures, and first sent a weather map to the plane while on its way to Cologne. This enabled the pilot to determine far better than he could have done even with a detailed report what sort of meteorological conditions he would encounter en route. On another trip he received a similar chart that gave him full information of an advancing thunderstorm. Knowing the speed at which he was traveling, he was thus able to tell at what point along his course he would be likely to encounter the storm and to steer clear of the indicated area of disturbance. Again, when flying to a certain airport that in the meantime had been flooded by heavy rains, the aviator was advised of that fact by a radio picture of the field in that condition. So forewarned, he lost no time in avoiding it and in seeking a suitable landing place elsewhere.

The element of time is a vital factor in aerial navigation because minutes mean miles covered. For that reason any saving in time in putting a message across accurately is worth while; and pictures, frequently, are not only more explanatory than words but can be taken in at a glance. The actual transmission is also but a matter of minutes: by the system under consideration an airplane can receive a chart or picture within three minutes after its dispatch.

Due to the combination of Aeronautics with Popular Aviation this issue, it was necessary to omit the second of Mr. Rathbun's series "Simple Lessons in Flying," but the series will be resumed in the next issue.

Hunting for the Missing Pilot

MANY are the stories of hardship, daring and pathos in the search for Carl Ben Eielson, brought back by Maj. H. C. Deckard, of the Fairchild Airplane Manufacturing Corporation, who represented The Aviation Corporation on the expedition sent to Alaska, and probably one of the most interesting is the story of Harold Gillman's part. Gillman was the pilot who, with Joe Crosson, discovered the wreck of Eielson's plane on the bleak Siberian coast.

Gillman, a Fairbanks youth, learned to fly in Alaska under the guidance of Eielson and the two became fast friends.

When Eielson was lost and the search was held back by bad weather, Gillman went to Charles L. Thompson, in charge of the operations of Alaskan Airways, Inc., in the absence of Eielson.

"I want to join the search for Ben," Gillman told Thompson, "give me a plane." Gillman had had only about 200 hours of solo flying, mostly in a little plane of his own, unsuited for the search.

"But, Harold," Thompson told him, "you haven't had enough time, I can't send you out on a search like that. You've had no cross-country experience, and believe me you would need it to look for Ben."

"Nevertheless," Gillman replied, "just give me a plane. I want to look for Ben and I'm going to one way or another. Give me a plane."

Pilots are scarce in Alaska. There are only a handful, and pilots were needed in the search. Finally Thompson gave in as Gillman pressed his case and insisted on being permitted to go. He was given an open cockpit biplane and departed for Teller, the jumping off place for Siberia.

At Teller he and the others of the small group of pilots were held to the ground by one of the most severe sieges of weather Alaska has ever known. As the days dragged by with no sign of a let-up, and discouragement came to the little group, Gillman kept up the spirits *(Concluded on Page 80)*

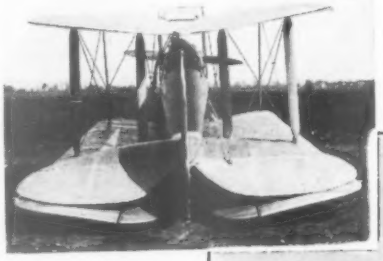
Paid Endorsements Taboo in Aviation

"BONUSES for stunt flights and similar inducements to pilots are forbidden by the code of ethics adopted by the American Petroleum Institute," says A. F. Winn, manager of the aviation sales department of Skelly Oil Company, Tusa, Oklahoma.

"Practically all of the large oil companies have long since discontinued the practice of paying pilots and others to use their gasoline and lubricating oils on endurance and long distance flights," continued Mr. Winn. "The aviation end of the oil business is getting down to business-like principles just as commercial aviation itself is doing. The same thing goes in the matter of selling petroleum products to airports. Oil companies have contributed largely to the development of airports and airways and will continue to do so, but the new code of ethics prohibits the giving of bonuses in the form of buildings, pumps and equipment in return for exclusive gasoline and oil concessions. There is no more reason for such methods in the aviation industry than there is in the automotive field. Fair competition is welcomed and is a wholesome thing for the consumer but unfair competitive practises have no place in the present-day picture."

Ready to Go

NO, THE plane below is not some new model ready to take off—but on the contrary is ready to be taken in. It is the Caproni 100 Ti with its wings folded back ready to be put in its hangar, or possibly a space not much larger than a one car garage. Airplanes with folding wings like this, take up less than half the storage space of a similar plane without folding wings.

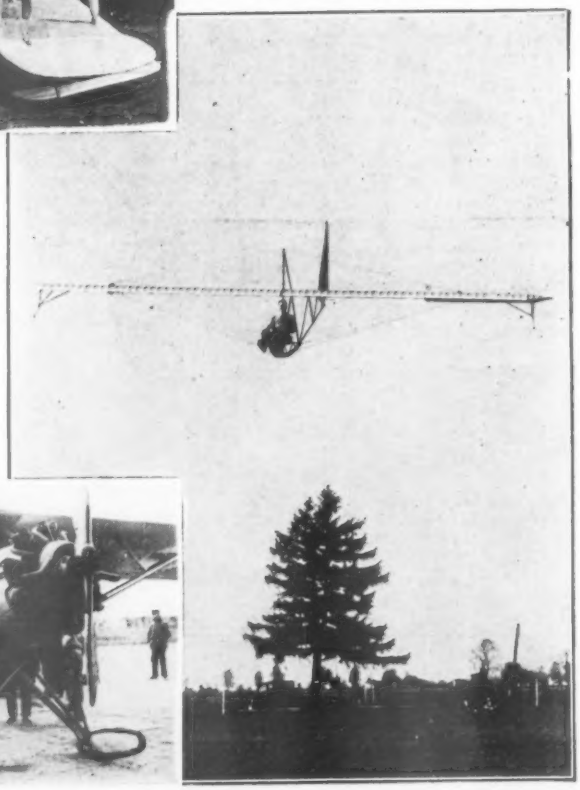


Above, the Caproni plane with wings folded.

Waco Announces New Gliders

THE WACO Aircraft Company announces the addition of a primary training glider to their line of aircraft. It will sell for $385.00.

A new positive-type towing hook, situated on the nose of the fuselage, is so designed as to be foul-proof. Should the tow line become fouled back of the hook, it automatically opens. A launching hook for shock-cord use is placed beneath the towing hook. According to tests run at the factory, the take-off speed is 20 miles per hour, landing at the same speed. The sinking velocity is computed at three feet per second, with the gliding angle 14 to 1. The wing span is 36 feet, chord 62½ inches, overall length 21 feet, wing area 184 sq. ft. and weight approximately 175 lbs.



Right, the Waco primary glider in flight.

An Airplane with Caterpillar Wheels

THE first airplane with caterpillars was built by a French Firm, and presented to the Villacoublay-Paris Aerodrome recently.

The caterpillars, according to the information furnished us, will enable the plane to land on any kind of surface.

We rather imagine the landing on caterpillars would be a bit rough. We also wonder whether the caterpillars can revolve fast enough for the 40-60 m. p. h. landing speed of planes. We will have to wait for our answer until we can secure more complete information on this new attachment.

Four Boys Start Model Factory

By OLIVER ARATA

A view of Vaugh Heath's workshop in which four St. Louis boys build model planes for sale.

HOW would you like to own your own airplane factory, be a dyed-in-the-wool business man, and even have the largest paper in St. Louis give you a big write-up about your business in its new section? This is what happened to a boy of Webster Groves, Mo., a suburb of St. Louis.

A very ingenious young man, in his teens yet, named David Gibson, and a neighbor of Vaughn Heath, the president of the progressive and growing firm known as the Mercury Model Aircraft Co., 251 S. Orchard Ave., Webster Groves, Mo., would come to Heath's home and enthusiastically praise everything relative to airplanes. Later, Vaughn, who is now just 18 years, became enthused about model airplanes. They made planes of this type together. They experimented. They worked and played. Finally, the business began to grow. It was not a business a few years back, just a hobby.

Gibson sold his interest to other boys a year ago. Now there are just four boys in this company, their names being, Thomas Vaughn Heath, President; Miller Held; T. J. Shands, who is the cousin of Vaughn Heath; and Walter Paul Zemitzsch.

A year ago Vaughn Heath was stricken with infantile paralysis, which left his entire left side paralyzed. He is improving rapidly, however, and just recently a jacket and brace were taken off his body. He is well on the road to recovery. Even yet, however, he must use crutches and a wheel chair to get around.

However, when I called upon him, Vaughn greeted me with a smile, and yet one could see that he had suffered much.

These four energetic boys have gone into the making of model airplanes on a serious scale. They have their own business stationery, which is really splendid. They have their own trade mark on it, being two wings, with M. M. A. between each wing. Their slogan is, "If it's a Mercury it will fly." And I must add their planes do fly. Boy! how they fly. The Shands boy demonstrated one to me. It took off from the ground, just like a regular airplane will. It took off from his hand, in mid-air; it flew as perfectly as any plane could.

The boys make over 25 different models. They draw their own models, make their own blue-prints, and make fine prints. The president of the Universal Aviation Corp. felt so elated over the boys' abilities that he recently presented them with a genuine and full-sized airplane blade for their small yet complete and efficient factory.

Their average production has been about 50 model planes, netting them a gross revenue of $200 per month. Most of this is profit. The company also sells all materials for making planes, contest kits, unassembled and assembled planes. Their planes are extremely reasonable. They are guaranteed to fly. And they do!

THEIR small and efficient factory is an ex-summer house, this being equipped with all lathes and tools necessary for the proper making of airplane parts. The atmosphere there is all business, and again the business is all aviation. Work reaches its heights in the afternoons, after school hours.

Vaughn Heath took sick in 1928. For over five months he was in bed, unable to move, yet in two more months he was looking for a hobby. He always loved aviation. His first model was a St. Louis Robin, which took shape under his deft hands. One of his boy friends offered to buy one from him, which was the real beginning of the business. Just last June Vaughn called in three of his friends, then organized his present successful company, which is soon to go into the national field. The shop is a very busy place during the summer and vacation days.

Vaughn told me, "The big rush came during the endurance flight of Jackson and O'Brine, the St. Louis endurance fliers. We sold 24 models of their plane within a few days."

The workshop is cool to work in during the summer months and will be inclosed during the winter time. There you will encounter rows of shiny tools, and the perfectly done blue prints from which the four builders erect their perfect little planes.

Their best sellers are the following models: the Baby Pusher, Endurance Tractor, R. O. G., pursuit models, as, Curtiss Army Hawk, Sea Hawk, Nieuport Biplane, Keystone Pirate, a duo-motored bomber, some types of cabin monoplanes, St. Louis Robin, Aristocrat, Travelair, and several Junkers and Fokker models.

During the past summer, a model contest was held by the boys, which drew 25 entrants, while prizes for distance flights as well as endurance flights were given.

All the money the company is making is being put back into stock, tools, advertising, and the like. The boys are working toward another objective, that of owning a man's-sized airplane—a ship they can fly themselves.

What Your Handwriting Reveals

By

DR. M. N. BUNKER

MODERN aviation is American born; also, it is holding international prestige because of the young men and women from American homes, who are entering this field, developing it, and at the same time making names for themselves.

We have our Lindbergh and our Earhart, alive and active, but also we have other Lindberghs and other Earharts in the making. Young men and women just going into high schools and colleges are going to be the leaders in the aviation field within a few years.

It is this fact that makes doubly interesting and valuable the researches of an Italian scholar some three hundred years ago when aviation had not been considered. That man and what he started have a direct bearing upon our modern life, and for this reason upon those young men and women who are considering aviation and its opportunities.

The man in question was Camillo Baldo, who early in the seventeenth century began giving serious consideration to the handwriting of famous scholars of his time. Comparison taught him that educated men who were able to write, might express similar thoughts, but they did not write alike. Their letters were similar, but no matter how carefully educated, each man wrote in his own peculiar way. With this in mind Baldo began comparing the handwritings of each man with that man as he knew him, and as early as 1622 had proved that one man wrote in one way because he had one kind of disposition or character, and that another wrote in another way because he was a different kind of man.

It was this discovery, made some three hundred years ago, that makes it possible for us to know the true characters of our great aviators, and so discover just what kind of men and women are most successful in the air.

It is a science that kills idle pipe dreams. It shows a man what he can do, and gives him a picture of the natural qualifications he has for doing it. This science of Grapho-analysis tests the individual aspirants for aviation, and makes it possible for these men and women to know themselves, to measure their own personal characteristics alongside those of the most successful men and women in the field. All that is necessary for such a test is an ordinary specimen of writing of a man or

This home-made airplane is powered with an outboard motor-boat motor and cost $800 to build.

woman, for writing tells the whole story of the individual.

This, for example, is the story it tells of Charles Lindbergh; a story that the

Charles A. Lindbergh

newspaper writers have missed, but one that shows the reasons for his success.

It says, first of all, that he is master of himself. It shows certainty of thought. Charles Lindbergh knows what he wants, what he expects to do. He has opinions. He has a very great sense of pride; a kind of pride that spurs him on to make the greatest possible success; he simply must put the best effort he can into anything that he attempts.

This bit of writing answers one question that has puzzled many; they have wondered how he could make his famous flight; they have called him lucky. His writing tells the story. Charles Lindbergh is careful about little things that are important; he is exact. He does not start anything until he is thoroughly prepared, and then he goes through. This is the nature of the man.

Another question answered by his handwriting is regarding his refusal to the show people who wanted him to tour the country, appearing in the theaters. This writing says that Lindbergh is capable of talking well enough—even very convincingly—when there is something to say, and some reason for saying it, but he has absolutely no desire to talk just for the fun of talking.

However, if he had toured the country on any sort of show program, he would have been compelled to make an entertainer of himself—and his writing says that he is never going to be an advertiser, or a show man. Instead, he is the type of man who does what he attempts, and after the doing is completed lets the finished task do its own talking.

This particular trait is also shown in the writing of Amelia Earhart, just as she also shows that self-reliance which so completely characterizes the Lindbergh writing. Miss Earhart knows

Amelia Earhart

that she can do things. Furthermore, she has a most remarkable strain of poise. She does not lose her grip. She might, for instance, have been a Red Cross Nurse *(Concluded on Page 81)*

Low Powered Home-Made Airplane

GERNOT HEINEMAN, a sophomore at the University of Washington, designed and built this tiny airplane shown in the accompanying two photographs.

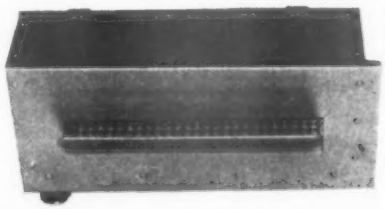
The most unusual feature of this attractive little plane is its motor. It is powered with an ordinary Johnson Seahorse outboard motor, of only 32 H. P. It is equipped with reduction gears to adapt it to air use. The plane weighs only 300 pounds and is capable of carrying 300 pounds more. It is 16½ feet in length, 7 feet high, and has a wing span of 25 feet. The cost of building this ship was estimated at approximately $800.00 by the builder. He is confident however, that a similar ship could be built for only $400.

Device for Ventilating Cabin Planes

ORDINARILY one does not think of ventilation as a problem in aircraft travel. However, with the advent of closed cabins as standard practice, ventilation has become a problem, particularly for long trips.

The high speed of airplane travel creates an unpleasant draft when ventilation is provided by a plain open window. Again, with open windows the noise of motors and propellers is objectionable, and there is always the hazard of passengers leaning out and dropping objects from the cabin.

Many passengers on their first trip tend to feel faint, and it has been found that a direct breeze of cold air



will often revive the passenger and prevent sickness; it is important therefore to provide for this when the occasion arises.

With the view of overcoming these difficulties, a company in San Francisco has developed a special airplane ventilator known as the AER-O-VENT.

There are two principal working parts, an air scoop and a shutter. When not in use, the scoop is withdrawn into the interior and the shutter is flush with the outer surface thus offering no air resistance and closing the cabin to the weather. When in use, the shutter withdraws and allows the scoop to project, drawing in the desired amount of air, which is directed in streamline currents to minimize resistance. A convenient handle permits individual adjustments of each ventilator through several stages until in the full open position a direct breeze on the passenger is obtained.

XUM

MODEL DEPARTMENT

How to Build the Leja Fuselage Model

By BERTRAM POND

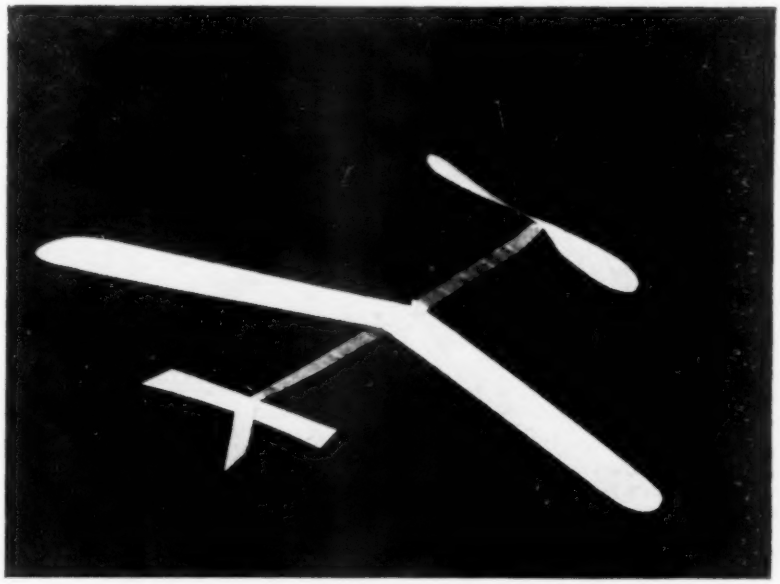


Photo of a duplicate of the original Leja model which was lost on its record breaking flight.

THE Leja fuselage model is a real honest-to-goodness record breaking ship which is extremely simple to build. The machine flew in a contest in Chicago for considerably longer than 16½ minutes. However, this is the maximum time which was allowed by the officials who lost sight of it high in the air out across Lake Michigan at this time. According to the good rule book when a model disappears from sight, even though it is high in the air, the official timing watches must be stopped.

No doubt you will want to build one of these fine world record models because of its remarkable performance and because of its simplicity of construction.

Though this Leja model was flown officially in the outdoor fuselage contest it can be flown equally well indoors. There is one national contest in which fuselage models are required to have a cross sectional area equal to the square of 1/10 of the length of the fuselage proper. Though all fuselage model contests do not contain this rule, which, incidentally, was borrowed from English model fliers, the Leja fuselage model can be made to fulfill the requirements of this contest by enlarging the cross sectional area of the fuselage at the front to 6¼ square inches since the length of the Leja fuselage is 25". 1/10x25 squared equals 6.25 square inches of area which the fuselage must have to fulfill the requirements of this one particular contest. Simply build the model exactly as described in the following article and add a hump or super-structure around the fuselage near the nose to give at least 6¼ square inches at one point. Such a hump or swelling on the fuselage may look awkward, but because of the slow flying speed of the Leja machine and the increased stability, since the wing must be moved forward to counterbalance the weight, this machine will still be one of the lightest and best flying fuselage models yet designed.

Study the drawings and description very carefully before beginning to construct the machine. You will note the fact that the rubber is fastened at the rear of the machine to a plug by means of a combination rear hook and "S" hook, thus saving some weight. You will also note that at the front of the machine a washer only is necessary, thus eliminating the weight of a bearing.

FOR building this model you will need a kit containing the following materials:

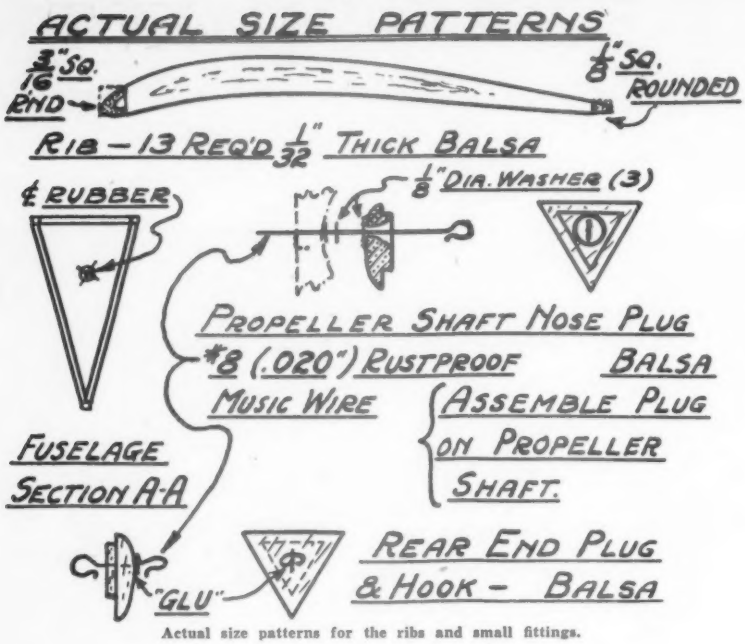
1 balsa propeller blank 5/8" x 1¼" x 11".
1 piece of balsa 3/32" x 1" x 25" to be sanded down smoothly to 5/64" for making the body longerons.
2 pieces of thin balsa veneer 1/32" x 1" x 20" for ribs, wheels, and body formers.
2 pieces of balsa 1/8" x 1/8" x 20" for trailing edge wing beams.
2 pieces of balsa 3/16" x 3/16" x 20" for entering edge wing beams.
1 piece of Tonkin bamboo 10½" to 12½" long for wing tips and landing gear.
1 oz. Glue.
1 oz. paper cement.
1 oz. light dope.
2 3/16" diameter washers.
1 sheet of model covering tissue, lightest and smoothest obtainable.
1 ft. No. 8 music wire or
1 propeller shaft and special rear hook.
9 ft. 1/8" x 1/32" flat rubber.
1 ft. 1/32" square rubber used to hold the wing in place.

Constructing the Fuselage

YOU will note that the fuselage is of simple triangular cross section. The longerons are tiny balsa slivers 5/64" square. These should be selected for uniformity from medium tough balsa. The fuselage is braced every 1½" with braces of the same cross section as the longerons. These braces or formers are assembled so as to form a triangular construction. Note that the fuselage is tapered at the front and the rear.

After the frame-work of the fuselage is completed it must be stiffened to stand the strain of the rubber, since no motor base is required or used. The entire fuselage, with the exception of the two small 5/8" triangular openings on each end, is covered with model tissue and doped with several coats of light dope. This dope should draw the paper taut. The torsional or twisting strength of the fuselage depends almost entirely upon the paper covering, so you can see the necessity of doing a neat job and doping it so that it shrinks to produce a smooth tight covering.

The propeller bearing is simply a washer cemented on a thin balsa wafer or block which is shouldered to fit in the small triangular opening at the front of the fuselage. The end of the fuselage rests against the shoulder on the plug, preventing the rubber from pulling the plug inside of the fuselage. In a similar manner the triangular shape of the recessed part of the plug which fits into the triangular shaped end of the fuselage prevents the plug from rotating. It is possible to make the propeller removable from this plug, but it is advisable on your first model to assemble the propeller shaft through



Actual size patterns for the ribs and small fittings.

the washer cemented to the front of the plug so that you will not encounter any unnecessary difficulties.

The rear plug is identical to the front plug, except that instead of having a washer cemented on to it for a bearing it is fitted with a special "S" hook. This "S" hook should be cemented to the rear plug so that the "S" hook can transfer the twist of the rubber to the plug and thence to the fuselage without the "S" hook rotating or pulling through the plug. The rear plug, as you will see, is attached to the winder for winding in the same manner as an "S" hook on a flying stick model.

THE landing gear, consisting of two fine oval section bamboo splints, is attached to the front of the fuselage as shown. For lightness the wheels are not made to rotate as contest rules to date have not specified that the wheels must rotate. The wheels only fulfill the requirement that fuselage models must have wheels. Because of the large wing surface carried and the light weight of the model the machine lifts off almost immediately and it is not really necessary that the wheels rotate.

The rudder and elevator complete the fuselage unit. They are made of fine bamboo splints to the size and shape shown in the drawing. The rudder and elevator assembly is cemented on top of the very rear end former of the fuselage. Note that the elevator has no angle of incidence to the center line of the fuselage. The longitudinal dihedral (or the difference in angle between the wing and elevator) is obtained by the small elevation block under the front edge of the wing as you will see later. The elevator ribs on the original Leja model were straight and it is recommended that you follow the original plans at least on your first model of this type. The rudder and elevator units should be covered with fine model covering tissue. The completed fuselage, with rudder, elevator, and landing gear should weight about .120 oz.

The Propeller

THE propeller is carved in the usual manner for obtaining true pitch in model plane propellers. Lines drawn diagonally from corner to corner of the widest sides of the block are used for guide lines in carving, as it is assumed you already know. Carve the propeller down as far as possible with a very sharp knife and finish with coarse sand paper and then with fine sand paper. Sand a slight camber into the rear of the propeller blades. You will note in the drawing that the propeller hub is cut away for lightness, only 3/16" remaining. However, for strength the hub should be 3/32" to 1/8" wide at the center. The blades of the propeller taper in thickness from 3/64" near the hub to about 1/32" out toward the tips. The shafts should be installed at the exact center of the propeller and the propeller very carefully balanced. A paper pattern should be used to check both propeller blades to see that they are identical in size and shape.

Before attaching the shaft I suggest that in the fuselage construction the triangular recess and shouldered plug which fits into the nose of the fuselage should be made and slipped into the propeller shaft with the washer or bearing side facing the propeller. You should now attach the shaft with the bearing plug to the propeller. It is advisable to have an extra washer between the propeller and the bearing plug. Bend the end of the propeller shaft into the form of a sharp cornered letter "U". This should be pushed back into the propeller hub and cemented into place after first carefully aligning the shaft so that the propeller rotation is true. The completed propeller, with the nose plug, should weigh about .030 oz.

The Wing

THE wing for the Leja record fuselage model is constructed in a very simple and efficient manner. Thirteen ribs of the pattern shown in the drawing should be made from 1/32" veneer. The entering and trailing edges are made of square sticks of balsa wood, sanded to a triangular shape. The entering edge is slightly rounded. The entering edge on the original Leja machine was slightly hollowed out. A handy tool to use for this operation in case you wish to make your model as light as possible can be made from a section of umbrella stay of channel section sharpened to a keen cutting edge.

The bamboo wing tips should be bent over a balsa and bamboo bender. Considerable time can be saved if one wide piece is bent and the two wing tips made by splitting the wider piece apart. An actual size paper pattern of one-half the wing will speed up the work of assembling the wing parts. Each half of the wing can be cemented together separately and later joined at the center with cement. After the wing halves are completed they should be carefully joined at the center. The tips of the wing should be supported 4" above the center of the wing where the cement is to be applied. Several coats of cement should be used on both top and bottom of the center junction of the two wing halves. Each coat should be allowed to dry thoroughly before applying the next. To preserve the proper dihedral while cementing the bottom side of the wing joint the center of the wing should be supported about 4" above the work table, especially because the cement on the bottom is liable to soften the cement first applied on the opposite side of the wing beams.

To complete the wing frame-work the center rib should be set into position and cemented. Cement an elevation block as shown on the drawing under the front wing beam. This gives the wing approximately the correct amount of angle of incidence for lengthwise or longitudinal stability. The wing should be covered on both sides with a light smooth model covering tissue. The efficiency of this slow flying model depends considerably upon the camber of the under side of the wing. Therefore, great care should be taken in papering to see that the paper is cemented to the under side of the ribs on the under side of the wing so that the paper does not stretch straight across between the entering and trailing edges. In addition, the wing should be covered as neatly as *(Concluded on Page 58)*

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possible as record performance depends considerably upon the smoothness of the wing surface.

Flying the Model

STRING up a rubber motor, consisting of four strands of 1/32" x 1/8" flat rubber. Drop a string or thread through the fuselage and attach it to the rubber motor. Pull the rubber motor into the fuselage, after you have hooked the proper plug on the other end. Then pull the rubber on through, untie the thread, and attach the remaining plug. Attach the wing to the fuselage by means of a light weight rubber band made from a piece of 1/32" square rubber or a piece of golf ball rubber, or similar, small size rubber. Glide the model for finding the approximate adjustment for the wing and you are ready for a trial flight. Be sure on your trial flight that you can follow the model for a great distance as even when only partly wound, considerable duration can be obtained. The rubber may be lubricated with the latest improved rubber lubricant, though it is not advisable because your Leja record model, if constructed as described, and adjusted properly, stands a good chance of flying out of sight, even without the increased efficiency of a rubber lubricant.

The original Leja fuselage model weighed approximately .420 oz. However, you can expect some wonderful results, even though your model weighs up to .650 oz.

Next Month

For the next issue, The Model Department will feature the construction of a 24" Super Fokker Universal model. Complete instructions and outline drawings will be included.

Do you want a free copy of "Stunt Flying?" It's a mighty interesting and instructive book. See the free offer on page 57.

MODEL BUILDERS!

LOOK! An excellent contest model. A light weight 37-inch Twinpusher that will fly from 2 to 6 minutes in any weather. Simple construction with all the latest features. Holds local junior record with a 9 minute 40 second flight. Kit contains full size plans with detailed instructions, all balsa is cut to size, finished ribs, and wire parts formed. Plenty of cement, dope and extra material for emergencies.

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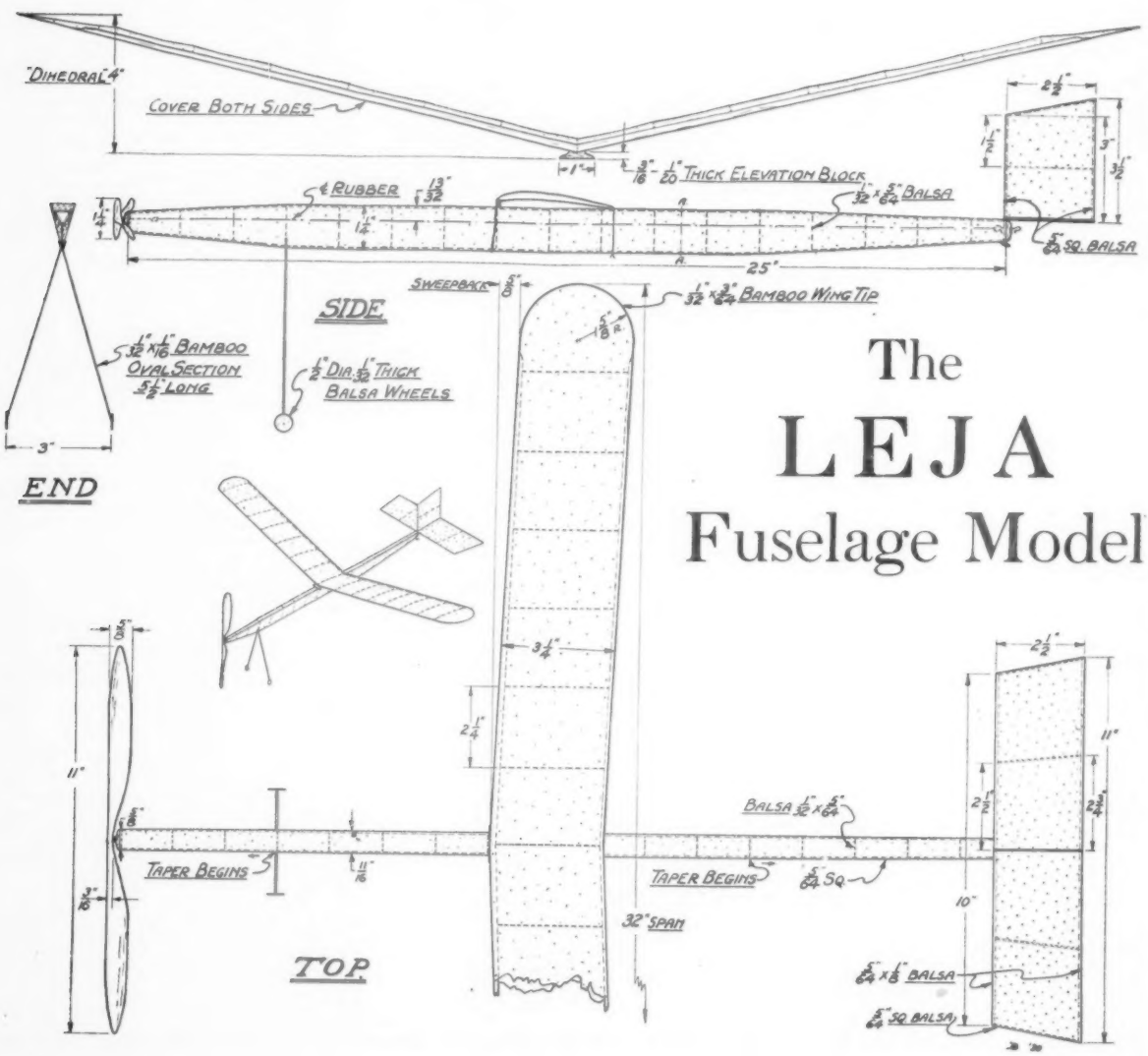
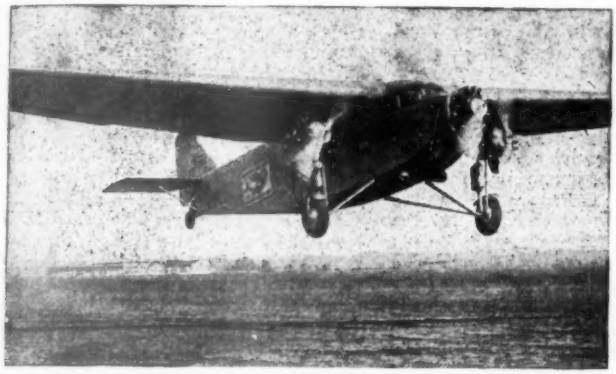


WHAT *the World Thinks* of this National System of Government Approved Aviation Schools

Let the opinions of those who know through actual experience be a guide to you in selecting an Aviation School. You cannot, then, go far wrong. Read these letters taken at random from our files:

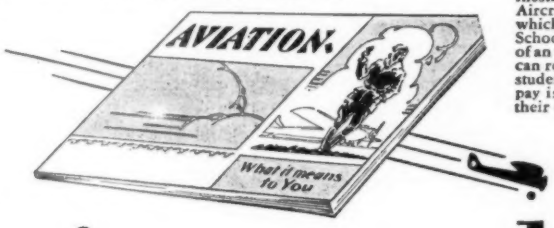


A transport student pilot taking off in a trimotor plane, training in this type of aircraft being a part of the Universal Transport Pilots Course.

Many pages of this magazine could be filled with such letters from Universal graduates and from executives in the aviation industry who have employed Universal graduates. Seldom will you see in *any* kind of a school so enthusiastic a student body or such a loyal spirit among its graduates.

You will be interested in reading "Aviation—What it Means to You"—a book about Universal Aviation Schools which we gladly send you free.

Sent free This book describes in detail the various Flying, Mechanics, Welding, Business and Extension Courses offered in Universal Aviation Schools, and gives you all information which you will want to have. Send for your copy today.



"I thought you might be interested in knowing after completing a course in aircraft welding under your instruction that I have built a Heath light plane fuselage and did a neat piece of work on it, too. Of course, a knowledge of blueprints is very helpful to me also, but without Universal's welding course I could have never done this job. I made back part of what the course cost me." —*E. Ten Eyck.*

"Mr. Roscoe Prescott, procured through you about two months ago, has proven very satisfactory as our Chief Instructor. Today we have had the pleasure of receiving Mr. H. D. Philbrick as Chief Welding Instructor, who by all appearances will prove satisfactory. We want to thank you for this service." —*Andrew L. Schaidler, Pres. The Aero Corp. of America.*

"This will come as a surprise to you, and I hope a pleasant one. You will see by the letterhead (Airlines) that I have succeeded, thanks again to the Universal School at St. Louis and its officials. I passed my examination for Transport Pilot the 1st and am exceedingly happy. My mother bought me a ship, and I am doing very well here. The first two months have passed and in figuring up my average earnings I find that it averages $1500 the first two months and expect to do better." —*Harold S. Platt.*

"The training received in the business class combined with my previous sales experience fitted me for this position to the satisfaction of the .....Aircraft Corporation. I again want to thank you for your personal interest and wish you continued success." —*V. M. Huff*

"The Universal Extension Course is beyond doubt the most complete course in the world. It has the best authentic information and instruction, this being obtained by Universal's practical everyday experience in aviation transportation. Your course is as good as two years of college education because it is easily understood, clearly illustrated, and you seem to have a personal acquaintance with each instructor who writes his part of the course. There is only one thing I regret about and this is that I did not take the course sooner. If there should be anybody who is in doubt as to whether the course is worth the time and money I wish you would refer them to me. There is no doubt but what it is the foundation for my success in aviation." —*Robert Deverell.*

"Eighteen months ago I started my training at the Universal Flying School in St. Louis. After completing a Limited Commercial Course I secured a position as a pilot where I quickly got in enough flying time to take my government transport examination. Thanks to the thorough ground school training and excellent flying instructions I had received at the Universal school, I had no difficulty in passing all government tests. Since that time, my progress has been rapid, each step forward being accompanied by advancement in pay. While I now get in as much flying time as I wish, my work is largely directing the flying of others." —*Ray Kutterer.*

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WOMEN'S ACTIVITIES

EDITED BY LADY MARY HEATH

MISS LAURA INGALLS has created an American record by looping 344 times, which is considerably greater than the record held by Miss Stinaff. The world's record stands at a little over 700 loops which were made by Miss Adrienne Bolland of France.

Miss Winifred Spooner recently won the main event in the Berks, Bucks & Oxon speed championship for private owners. Miss Spooner has been made the champion woman pilot of the world by the International League of Aviators.

Mlle. Lena Bernstein has created a new women's world's record by keeping her Klemm machine in the air in France for slightly over 35 hours.

Six of the nineteen members of the Women's Wing & Prop Club at the Boston Airport participated in the New England Air tour. It started from the Springfield Airport and ended there on May 30. The president of the Club is Miss Lorraine Defren, who is also chairman of the Contest Committee of the Boston Chapter of the National Aeronautic Association.

There are now 203 licensed women pilots in the United States, which exceeds the number of any other two countries of the world. Sixteen of these are transport pilots.

Two new aerial working girls have taken out their licenses. Miss Bettie Russell recently took her limited commercial license at Alameda, California. Miss Madeline B. Kelly from the same state makes the second member.

The annual meeting of the Women's International Aeronautic Association will be held next month in California. Mrs. U. G. McQueen of 141 North Lapere Drive, Beverly Hills, California, is acting as founder and present chairman. I have the honor to be its president.

Three new women's glider clubs have recently been organized in the west. The Anne Lindbergh gliders meet daily at San Diego. They are using a Bowlus glider. Three of its members have already won glider licenses. Miss Jean Staff is now president of the Marvel Crosson Glider Club of Los Angeles.

Miss Margery Brown of New York, who is traveling in Italy, has taken up a Breeda cabin plane at Milan and has flown from there to Rome.

In Italy the Countess Giacinta Bonmartini is the first woman to have qualified as a licensed pilot.

Mrs. Mary Heneghan, over 90, has just taken her first flight at Detroit, Michigan. She is very much in favor of flying.

Transoceanic Fliers met at the Hay-Adams on the morning of the 25th of April. Miss Earhart, the only woman to cross the Atlantic by air, who is now assisting the General Traffic Manager of T. A. T., was present.

Miss Myrtle Brown, who has ten hours of flying experience to her credit, flew over the New York Aviation Show carrying as a passenger Mrs. Charles C. Keevy, who dropped into the crowds below envelopes containing tickets entitling the finder to free association activities.

The Pittsburgh Women's Aviation Association recently had as its guests Elinor Wagner, Ida Snyder and Frieda Zeund. Plans for a glider day were discussed and an inspection made of workshops and hangars.

Fifty women of the Philadelphia Club of Advertising Women recently flew to Washington to attend the convention of advertising women held in that town.

Miss Frances Rees, who recently descended by parachute from 14,800 feet, is still behind Mrs. Omlie's fine record. 16,400 feet held by the French woman comes as the world's second rating.

Miss Mildred Kauffman, Kansas City transport pilot, who recently became a member of the Caterpillar Club when looping above that city, has now received the tiny gold caterpillar emblem of the Caterpillar Association.

Many women aviators met in Detroit during the Detroit Aviation Show to discuss the Women's Air Derby for next summer. Among those present were Mary Van Mache, Amelia Earhart, Blanche Noyes, Mrs. Clare Fahy and Mrs. Omlie.

At a recent meeting of the Women's National Aeronautic Association Mrs. Orra Heald Blackmore of Detroit was re-elected president. Other officers elected were Mrs. George Shaw Green of Dayton, 1st Vice President, Mrs. Clark D. Stearns of Miami, Florida, 2nd Vice President, and Miss Rena B. Schlee, secretary.

Miss Ruth Nichols, who organizes the aviation country clubs, recently flew Col. Chamberlain and Col. Fitzmaurice to Chicago for a press club opening. In the evening they were entertained at the Chicago Press Club. Col. Chamberlain speaks very highly of Miss Nichols piloting.

The Heights Women's Flying Club, with headquarters at the Fitzmaurice Flying Field, Masapequa, Long Island, held a meeting early this month, when many women aviators were entertained.

Demonstrating the ease with which it is possible to learn to fly, three women, Mrs. Helen Gillespit, mother of three children, Miss Esther Wagner and Miss Dorothy Galbreth, soloed after their first day's instruction at Roosevelt Field.

Mrs. Margaret Evans Crumplet has been elected president of the country's first National Women's Glider Club. She comes from Wichita.

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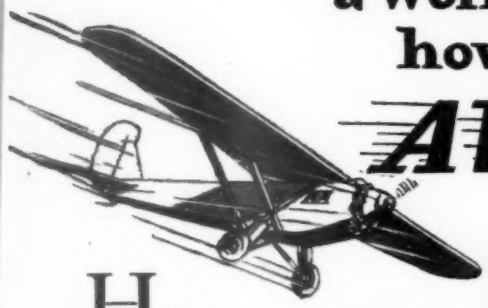

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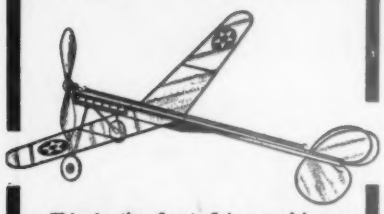

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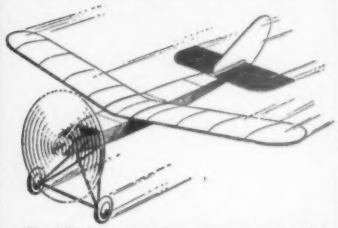

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(Continued from Page 43)

little, he will find that he can not think clearly. It is for this reason that tests are made of the men who explore the heavens, to find out just how much they can withstand of the unusual air conditions.

An aviator in need of oxygen may read his instruments backwards, or write numbers incorrectly. Fortunately, common sense still is able to stop him in his error. Flyers have watched the little white hand on the altimeter dial climb up to 25,000 feet and have been amazed to find themselves thinking that it was registering this distance below sea level!

An aviator must be able to think in split seconds, but up in the rarefied atmosphere he may take as long as three seconds to understand his own instruments. Sometimes he will not want to believe his clock, so slowly does the time drag. He will not want to believe what he sees outside of his plane. One such, felt real cross, he said, because the horizon seemed to be very much out of place, "but I felt that I was flying correctly, and that I was right and the horizon was wrong."

THERE is a definite purpose in the exploring of the upper regions of the earth's atmosphere. The continual attempt to push the plane to the very limit is to secure accurate information that will be valuable for the future. Aviators who fly five and nearly six miles above the surface of the earth are thus securing scientific facts that will one day be used for the benefit of all. It is all a part of the fundamental desire to master the air.

The "emptiness" of space has been denied. A radio "ceiling" is supposed to exist somewhere out near the regions that high-flying aviators go, but no one knows just where that ceiling is. Science believes that the facts of the rarer regions when gathered will lead to the secret towers that tell of the sources of gravitation, magnetism, electricity and radiation.

A more immediate and practical use for this extreme height is found in the ability to take photographs covering wide areas. Some photographs have already been taken showing an area of nineteen square miles. These were taken at 30,000 feet. With special camera, a few clicks from 40,000 feet might easily photograph a whole state.

In times of flood, large engineering projects, in times of war or forest fires, or disaster, such photographs would be of very great value. If machines can be made to fly with ease at around 25,000 feet, with comfort to the pilots, great benefits would result in the field of aerial photographs.

There are other hopes in exploring the secrets of the upper regions. If by some of the methods now being studied, it is possible to use an airplane at great heights, *(Continued on Page 68)*

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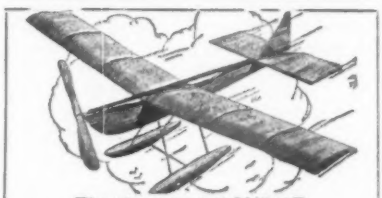

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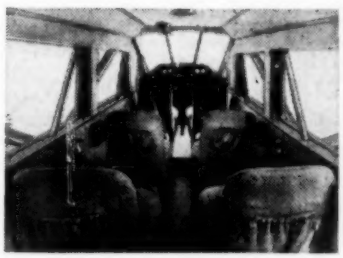

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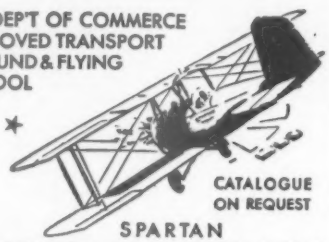

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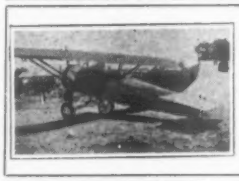

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("Magazine for Flying Technique and Aerial Motor Navigation")—21st year—1930.

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LOS ANGELES

An Airy Chat with the Editor

(Continued from Page 10)

from Mexico, and is representative of many others along the same line.

"I am 'air-minded', sixteen and a Junior in the American High School in Mexico City.

"For a considerable time my ambition has been to own and fly a glider; as you probably know there are no gliders or glider clubs in Mexico.

"I am sure that POPULAR AVIATION has come to my aid. When I bought my first copy of your 'mag', the June issue, I received an agreeable surprise; knew that this publication was intended for 'air-minded' people and that with your aid I could get more information on gliding. For almost one whole year I have 'raked' the news stands trying to find a magazine along your lines.

"I am planning to organize a glider club; in school I know of any number of boys and some teachers who will only be too glad to be able to fly a glider. I also know of an ideal place for flying, with a place available for storing the gliders. The terrain is excellent for flying, the country is very smooth, a moderate breeze is blowing constantly, and the near-by hills afford strong lifting currents.

"We have been only waiting for more particulars in making and flying a glider, to start actual flying.

"In POPULAR AVIATION I have found several 'ads' which have helped me out considerably, and am only sorry that you do not devote any more space to: 'The most rapidly growing sport in America.'

"At the close of your article: 'What Glider Shall I Build' in the June issue, you promise working drawings of a primary glider in an early issue, that's what we want!

"Presently you will receive my subscription order to POPULAR AVIATION.

"Hoping for more material on building and flying gliders, I am,

"Your 'air-minded' friend,

EDWARD T. GOODARD."

The suggestion is a good one, Edward. And just to show you how glad we are to give you what you want, the complete drawings and instructions on building the Rhon Ranger primary glider begin in this issue.

AS SOON as all of us have had a chance to build this glider—there will appear in POPULAR AVIATION complete plans and instructions on building the popular Storms Flying Flivver. The Storms plane can be powered with a converted Ford or Chevrolet motor, and ought to provide a lot of fun in building.

BEFORE signing off you might want to read this letter we received from our French correspondent:

"Replying to your letter of May 1st, on the subject of stories by French War Aces, I believe that I can get such a series for POPULAR AVIATION though it may take a little time. I have made inquiries at the Aero Club de France and will have more definite information on this later.

"Unfortunately many of the more prominent War Aces whose names are well known to Americans such as Guynemer, Nungesser, etc. are deceased but it is probable that others such as Sardier who is officially credited with twenty-four victories, will be willing to write such stories.

"I am also informed that aces who are still in active service in the French Army are not permitted to write such stories while in the government's employ.

"Very truly yours,

PAUL E. LAMARCHE."

Keep right after it, Paul, and hurry, for we're all waiting.

NOTHING else to tell you about this month, but will have a lot of very interesting news for your next issue.

B. G. (Bob George) Davis.

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Assuring you of my sincere appreciation for all the things you have done for me. I am

Thos. H. Hatton.
Scranton, Penn.

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Dear Major:
I deem it an honor to be one of your students and have always found your instructions and service the best obtainable, because you give your students the knowledge needed by them in the simplest, shortest method possible.

I will boost you and your individual method of training to all who are interested in the study of aviation.

Edward Rutledge.
Louisville, Ky.

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Dear Major:
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Hamilton, O.

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You don't need to have a high school or college education to master my course. You do not even need to know anything about airplanes, motors or mechanics. My home course is thorough and complete. Everything is so clearly explained, with easy-to-understand text and pictures, that in a few short months you will be able to grasp every fundamental principle of Aviation ground work and you will be well on the road to qualify for any important aviation job paying $300 to $400 a month. My Home Study Course will give you all the knowledge necessary to pass the government's written examinations for mechanics' and pilots' licenses.

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After you graduate I help you get a job without cost. There's a great demand for men with Rockwell training.

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Floyd Prothero.

Solo in 7 Hours

Dear Major:
Your excellent advice prevented me from taking up Aviation the wrong way when I wanted to learn flying first. After I had completed your ground course, which thoroughly prepared me in the principle of flight, I was able to solo in 7 hours. I always will be glad to tell anyone that I am a Rockwell trained man.

Wm. C. Rickels.

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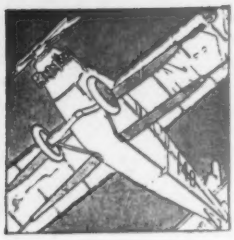

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8 Miles Up

(Continued from Page 62)

then it will be possible to take advantage of the air currents found in the higher altitudes.

BEGINNING at two miles above sea level and extending upward for five or seven miles is a stratum of air that blows in great swirls produced by the spinning of the earth on its axis. The greater the height the more furious is the blast of this relentless gale. In this layer the air is only one-fifth as dense as at sea level, so that little head-on resistance is to be encountered. Such a steady following wind would add many miles an hour to a traveling plane. With an accurate knowledge of engine, and with heated airplanes, and oxygen supplied interiors, it is the dream of aviators that great speed could be obtained, greater than anything ever thought possible on the earth.

Professor A. Von Parseval, one of the most experienced aeronautic engineers of Germany, has pictured the possibilities of flying at an altitude of nine miles from Berlin to New York by way of Vigo, Spain. He asks us to imagine a Goliath of the air with a starting weight of fifty tons and a useful load of nine and one-half tons. With nineteen tons of fuel, the radius of this Goliath would be 3,250 miles at an average speed of 215 miles an hour. Even greater speeds have been obtained than this in the denser air closer to the earth. Such speeds would cover the distance from Berlin to New York with a three-hour stop in Spain for refueling, in little more than twenty-eight hours. There are other engineers who say that such a craft could easily go more than 400 miles an hour and thus make the *(Concluded on Page 74)*

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$1000 in Prizes

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Upon enrolling you receive cadet's identification card. Complete your Champion model and send in the official entry blank. Upon qualifying your first model, you are licensed PILOT and awarded your Silver Wings. From pilot you advance to Flight Commander, Squadron Commander and the winner of the Grand Prize will be known as Champion's Ace for 1931! Talk about fun! Talk about thrills! There's nothing in model aviation equal to it for developing your knowledge of flying. Even if you do not wish to compete, you can get loads of fun building and flying these realistic models.

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Because they look so much like real planes, Hollywood movie studios are after Champion models to make air battle pictures. With these kits you build your own flying models of planes you will see in the show apparently dog-fighting thousands of feet up in the clouds. Champion models are new scale-type, flight-tested reproductions of real airplanes. Designed by M. I. T. engineer. Use featherweight balsa construction methods without sacrificing the effect of realism. U. S. Navy Specification balsa and Champion's new rubber thread— developing 10 per cent more power than commercial rubber thread—supplied in all kits.

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3 Models in 1

Here's a class 1 Contest model. The famous "Stars and Stripes" used by Admiral Byrd for all his survey and aerial photography work. Fairchild 71's are also being used to chart the vast resources of the Canadian empire, in the most extensive aerial mapping undertaking ever attempted. Now you can have a 2-foot COLORED Scale-type model of this famous plane, with FOLDING wings, workable doors, cellophane windows, all insignia, pontoons, skis, wheels, to fly r. o. g., r. o. w. or r. o. s. (rise off snow). Wings adjustable as well as folding so centers of pressure and gravity can coincide and assure long stable flights.

FULL SIZE BLUEPRINT prepared by professional draftsman. Directions describe and comment on each construction step. Eye-arresting model with its neat lines, orange and black-trimmed fuselage. "I get constant flights of 300 to 400 feet with ease" writes Bruce Glassford, Walkerville, Can. "My Fairchild flies as smoothly and steadily as the real plane. I think any beginner can build a satisfactory model from your kits," says Howard Doolittle, Southington, Conn., "Several of my friends have built your models and have had better results with them than any others they made," mentions Ross Goodwin, Chicago, when sending in a double order. "I sure think it's a keen plane," says Clifford Gilmore, Everett, Wash.

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Wing span 24". Chord—3 5/8". Length—17¼". Height—6". Wt. ¾ oz. Champion's new rubber motor, balsa framing readicuts stamped wing ribs and bulkheads, glue, dope, bamboo, fittings formed, finished balsa prop, prop block, blueprint, directions, complete in strong mailing tube, a $5 value sold direct to you, Canada, postpaid $2.20. U. S. postpaid..... **$2**

Wheeling, W. Va.

Everything arrived safe. Boy! They sure are good airplanes. Mother said that it wasn't worth anything if its only two dollars. But now she's said it's better than the one I bought for $4.98. It flew for 50 sec. r. o. g. Hand launched 1 min. 3 sec. before it hit a wire and pulled the wing off.

Yours, V. Szeligs.

FEATHERWEIGHT CONSTRUCTION ASSURES FLIGHTS OF HUNDREDS OF FEET

39½-in. Contest Class 5 flier. Full size blueprint, directions. Uses special high lift wing ribs and Champion's new rubber. Complete kit to make this model Canada, postpaid $3.30. U. S. postpaid **$3**

Another Class 5 model having remarkable duration qualities. Comes complete with full size blueprint, directions, and all needed materials. Great summer camp model, the type that has flown 12 and ½ minutes. Canada, postpaid, $3.30. U. S. postpaid..... **$3**

Flying Auto-Giro

New thrills for the model builder! Fanning windmill revolves by autogiro principle to create lift. Front prop rubber powered. Fuselage and stabilizing wing built from balsa and tissue, same as any other model. Great type with which to experiment. Learn how the autogiro flies by making this keen little flyer. Size of a 2-foot scale model. Blueprint directions, all needed materials and complete autogiro principle explanation included in kit. Canada postpaid $2.20. U. S. Postpaid..... **$2**

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Every important detail of LINDBERGH'S Transcontinental Record Breaker has been reproduced in the flying Lockheed Sirius or "Dog Star" plane. Streamlined pants, gold and orange pin striping, brilliant black fuselage and orange-red wings. Even the Lockheed trademark and Lindy's famous license number "NR-211" furnished in all kits. N. A. C. A. cowling gives it a speedy, racy line. Using Champion's featherweight construction methods, you should obtain unusual duration. It is the hottest model for 1930 and you will be the envy of every boy who sees it. Get one now.

Blown celluloid pants, lighter than balsa. Celluloid cowling, windshields, leather-trimmed cockpits with original instrument panel installations reproduced. Rubber-tired wheels. Hand-carved, standard pitch, 14-in. balsa prop. Ballbearing prop shaft. Landing gear attaches to wing, so can be adjusted for correct flight position. Wing span—4 feet. Covered with thistledown-weight imported silk. Canada and west of Denver, postpaid $10.50. U. S. postpaid..... **$10**

Same as above but colored tissue in place of silk. Balsa cowling, pants. Celluloid wheels, windshields. 4-foot wing span. Canada and west of Denver postpaid, $5.50. U. S. postpaid..... **$5**

2-foot model with formed balsa prop, balsa pants shaped, celluloid wheels, windshields, stamped ribs, full-size blueprint, directions. Canada, postpaid, $2.20. U. S. postpaid..... **$2**

FLYING CURTISS HAWK

Detroit, Mich., model builder wins District Prize with this flying Curtiss Hawk kit. Realistic reproduction of Uncle Sam's fast stepping pursuit ship. Celluloid wheels, imitation exhaustes, synchronized machine guns, staggered adjustable wings. Army insignia in colors, detailed full size blueprints, complete.

To be covered with yellow and olive drab tissue, Canada postpaid $3.30; U. S. postpaid..... **$3**

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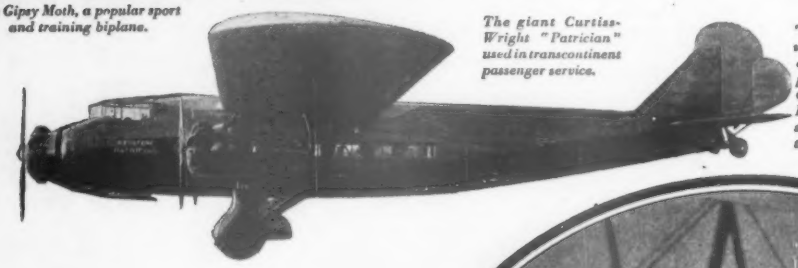

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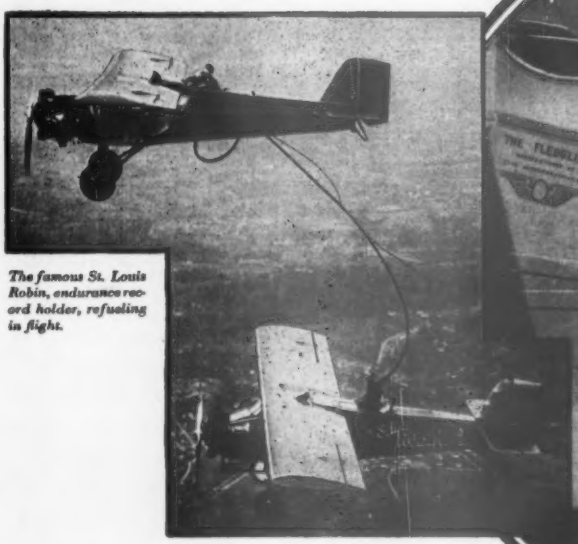

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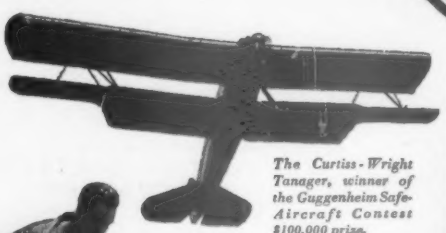

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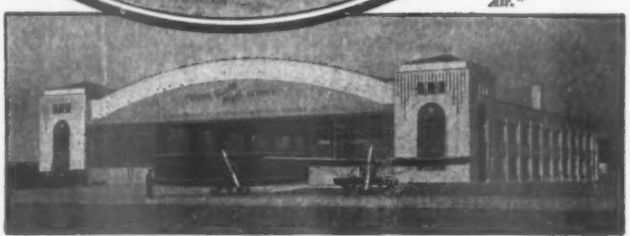

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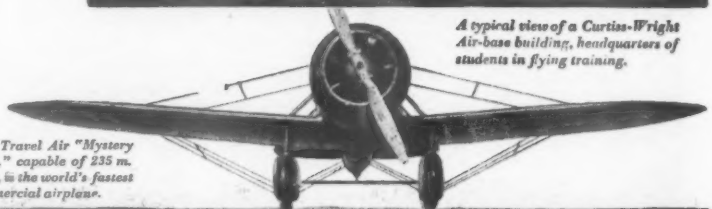

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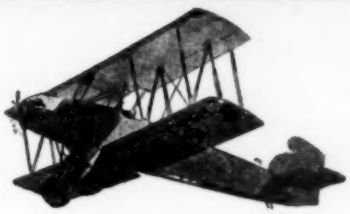

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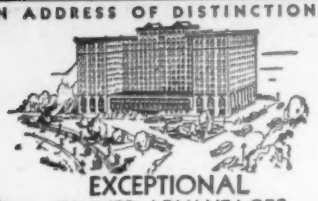

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Aerodynamics

(Continued from Page 50)

wings all external bracing will disappear, and at the same time the fuselage begins to disappear in the wing, thus bringing nearer the conception of a flying wing. In the Northrup Monoplane, recently flown and described in the technical press, a short nacelle displaces the conventional fuselage with the tail surfaces supported on outriggers. The nacelle, in which the pilot sits and a pusher engine is mounted, is seen from the diagram of Figure 19 to have disappeared almost completely into the wing.

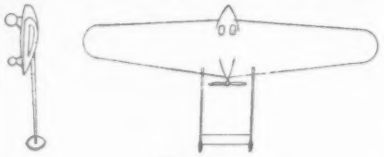

Fig. 19.
Northrup Flying Wing.

5. The use of pusher instead of tractor propellers. In the Northrup Monoplane a pusher mounted at the end of a long shaft is substituted for the conventional tractor propeller. No resistance producing parts thus appear in the slipstream. Perhaps there is indeed advantage in such an arrangement.

6. The use of careful filleting between fuselage and wings (See Figure 20). This decreases the interference between wing and fuselage. The filleting should be neither too large nor too small, however. Filleting between struts and fuselage and struts and wing should also be useful.

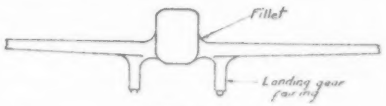

Fig. 20.
Wing and chassis fairing for a low wing monoplane.

7. The use of inclined wing struts of lifting section.

8. Careful attention always to the possibility of intereference as between chassis struts meeting at a small angle, etc.

9. The streamlining of landing wheels with parts and alternatively the use of retractible chassis.

Many other possibilities will suggest themselves to the reader. There is no doubt that in the reduction of airplane drag there lies a most fruitful field for the aerodynamicist and the airplane designer.

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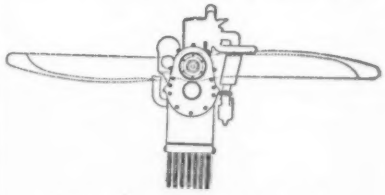

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8 Miles Up

(Continued from Page 68)

trip between sunrise and sunset, traveling at a height of seven to nine miles.

Such a voyage through the air would be as weird as it would be swift. The sky would no longer appear a glorious azure of light but instead it would be a black canopy. In the inky heavens the stars would shine both at noon and midnight like dazzling points. They would shine, moreover, with a hard, relentless steadiness. In that cloudless sky the sun would blaze fiercely because there would be no dust, and thick air to temper the blaze of light.

The business of checking air currents is becoming very important in air travel. With all the weather observatories in the world, they are too few to meet the growing needs. Observations made at sea in the north Atlantic within the past ten years indicate that at an altitude of 500 to 1,000 meters a strong east wind blows approximately one-third of the time. This means that at this comparatively low altitude it would be advantageous for aircraft to start flights toward the east across the Atlantic. For westward flights the help of favorable winds is smaller.

By other altitude studies it seems true that farther south there is a favorable westward wind.

AVIATORS in bombing practice learned a strange thing about winds. They found in ascending, the wind changes its direction in the way the hands of a clock move, to the right. Research discloses that in the Northern Hemisphere, they gradually change direction clockwise and in the Southern Hemisphere counter-clockwise. This is due to the rotation of the earth.

Other facts have been learned. Up to about seven miles, the air has considerable moisture; it has clouds, the temperature falls with the altitude; but higher than this there is a region sometimes called the stratosphere where the temperature remains from fifty-five degrees below zero to eight degrees below. It becomes just so cold and no colder. No one knows just why this is so, or if there is another layer higher up where the temperature goes to still lower figures. Some believe that it is frozen nitrogen, and others say that it again becomes warmer. No one really knows, thus there is still the desire and the hope of finding out.

There are still other questions relating to radio waves, the earth's magnetism, gravitation and similar unsolved riddles. The pilots who today are trying to ascend ever higher and higher are doing something more than merely beating records. There is usually something useful in beating a record; science can often find something in a given performance which adds to our sum of knowledge.

Had Lindbergh never flown the Atlantic, commercial aviation might never have progressed so quickly. So it is with the men who fly high. It requires very little imagination to picture a fuselage built as an oxygen chamber in which passengers would be as thoroughly at home as in a plane flying near the earth. It would not be hard to build.

There is no desire to build high-flying passenger planes until man has rounded out his knowledge by actual experiences in exploring the air around the world and the capabilities of an airplane far out on the earth's rim. When that has been done it is likely that the day will come when it will not be unusual to ascend to great heights and taking advantage of the winds that blow, fly to Europe, or to Pacific Coast cities or the Orient in a few hours.

Some day the venturesome aviators of today will be known as the first explorers of a strange region, as was Columbus of strange oceans, and as was Prof. Langley with his clumsy gliders and the Wright Brothers with their powered machines. Possibly the legendary pioneers, Daedalus and Icarus, who the ancients said flew so near the sun that the wax that fastened the wings to their bodies melted and sent them downward to the sea, will be remembered as the patrons of the high fliers who found the earth's ceiling.

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Fernic Monoplane

(Continued from Page 48)

son on the change in the lift of the main plane.

These theories are not all "paper" propositions. A wind-tunnel test conducted by professor Alexander Klemin in the aeronautical laboratories of the New York University, has shown the scale model to have these aeronautical qualities claimed by the designer. It could not be made to show tendencies to spin or stall, and Professor Klemin's report of his findings, is, although couched in modest terms, an excellent recommendation of the design.

The ship is powered with two Wright Whirlwind J-5 air-cooled motors set in nacelles mounted on the cantilevered main wings. These nacelles are unique. The upper faring or streamlining is detachable and when removed forms a small boat in which is fitted a small outboard motor for use in case of an emergency. These farings will not be fitted until the actual trans-Atlantic flight is made.

The wing span is sixty feet while the overall length of the ship is thirty feet and the height twenty-five feet. The wings are claimed to be unusually efficient and compare favorably with wing curves of the present day.

The fuselage is of monocoque design in which plywood on stiffened frames makes up the construction. It is well streamlined throughout with only four outside guys to support the fin in view.

The ship was designed by Paul Dronin, a native of Russia and a pupil of Igor Sikorsky, one of the world's foremost authorities on aeronautics. Mr. Dronin was an associate engineer with Mr. Sikorsky in the latter's office for several years.

The speed of the Fernic monoplane will be determined by flight tests. Plans of the designer indicate a probable high speed of more than 150 miles an hour and a cruising speed of about 135 miles an hour, although it is expected by Mr. Fernic, that the long-distance cruising speed will not be much above 125 miles an hour in order to conserve the fuel. It is designed to lift 1,100 gallons of fuel and will have a cruising range of 6,000 miles.

The flight to Bucharest, it was explained was to prove the capabilities of the ship and other models of this tandem wing type will be built as soon as the flight characteristics of the big ship have been determined in test and trans-Atlantic flights.

Mr. Fernic has been preparing for this trip for some months. He will have as his navigator and co-pilot Augustina B. Alberti, a former commander in the Italian Navy. During the World War Mr. Alberti was at first a navigator and later a commander on Italian submarines. He is taking flying instruction daily at the Westfield Airport in New Jersey. He has been practicing flying and taking observation sights from a Spartan, using a new system of position finding

Lindbergh's Record

(Continued from Page 42)

bullets take pictures of the objective airplane, and by means of cross-hairs on the film the theoretical point impact of a bullet is estimated. The two-seater during these attacks attempts to so maneuver that the blind angles are uncovered and the rear gunner is allowed to theoretically 'shoot down' the attacker. Split second timing devices show the time on the film and this determines who gets the first effective shot.

"The two-seater plane, a DH-4, was being flown by Lieutenant Russell Maughan of 'Dawn to Dusk' fame. Lindy, apparently in his anxiety to make an impetuous attack and thus surprise the two-seater, dived down behind the tail of the two-seater and climbed up underneath; at the same instant Lieutenant McAllister was coming swiftly down from above and as their paths crossed each other the left wing of Lindbergh's plane fouled McAllister's right wing. The planes locked together and went into a fall.

"I was probably two hundred feet to the rear and on about the same level and as I could see no apparent life in the two pilots I gave them up as lost. I dived down to follow them through the clouds, which were about five hundred feet thick. The wrecked planes beat me through but as I looked up I saw two parachutes open up just as they emerged from the underside of the clouds. Then turning my eyes to the falling planes, I saw them strike the ground in a mesquite thicket and immediately burst into flame.

"Lindbergh and McAllister floated on down and landed in a cultivated field beside a little country school. The school children got beyond control of their pretty little schoolma'am, and pranced all about the pair of fallen aviators. Lindy blushed profusely at all this attention which apparently upset him more than his recent near-catastrophe.

"Both Lindbergh and McAllister insisted upon going aloft again and as soon as we had transported them back to the flying field they took off, calm and unshaken. Flying in that vicinity since, I can still note the scars of the wreck in the mesquite thicket where the country almost lost its beloved 'Lone Eagle.'"

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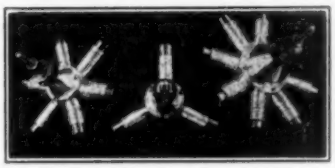

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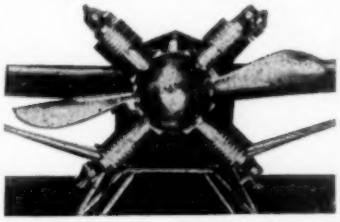

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Lt. Selff Nearly Freezes on Desert

(Continued from Page 44)

with all this on his person, Lieutenant Selff dared not snatch any sleep, for fear that he would freeze to death. Beyond the fire and in back of him he suddenly saw objects moving around in the darkness. A pack of coyotes had come upon him. They came so close he could see their yellow fangs and their jowls dripping with hunger. Soon the cold night air was hideous with their howls.

Rebuilding the fire, and executing a war dance about it, the man kept the coyotes and the cold off until the first gray streaks of dawn sent the baffled animals slinking away across the horizon.

Leaving a note on his plane advising nobody to stay there overnight because of the cold and the coyotes, Lieutenant Selff trudged out across the desert country in search of habitation or fellow travellers.

Late that night, after a hike of more than thirty miles, he saw something he thought to be a canyon or ditch. He crawled to the edge and looked over. Far below was a shiny something which appeared to be a river or a wide stream.

Tumbling down the steep side of the canyon as best he could, Selff finally managed to come to rest at the bottom of the thousand-foot pitch. Then he discovered that what he thought a river was really a road. The stranded airman followed this road for three miles before coming to an isolated oil station. Then, for the first time, he learned of his whereabouts.

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Immelmann Shot Down

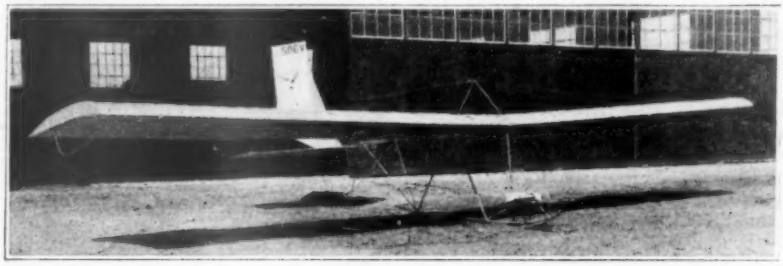
(Continued from Page 14)

mann turning and twisting in his almost mad efforts to escape. It seemed to me down below that they were toying with him as a cat does with a mouse, and then suddenly there came the death blow. One of the pilots pressed the triggers of his guns, and a stream of tracers shot forward straight toward the enemy ship. Instantly the remaining pilots opened fire, and I knew that nothing could save Immelmann now.

The blue streak of Immelmann's plane suddenly shot high above his five opponents, and I thought for a moment that he was going to elude them. But instantly I realized that no living hand had pulled that ship into it's zoom—and in the next second the plane burst into flames, and the menace to our squadron started that long plunge that ends only in a mass of smouldering wreckage far below.

Immelmann had paid! His account had been squared—the deaths of our comrades had been avenged, and as he continued downward, leaving a trail of black smoke behind him, I saw five boys who had saved me from a similar fate stunting their planes to give vent to their pent up feelings.

I eased back on the throttle of my ship, and turned in the direction of the flying field, where I landed safely. Shortly afterward the other boys came in, and there followed the world war's greatest celebration until Armistice Day. During dinner a toast was drunk to our dead foe's memory—and the next day a wreath was dropped over on the enemy side of the lines—our tribute to a fallen fighter. And then, well, back to the every day events of flying and helping to win the war!



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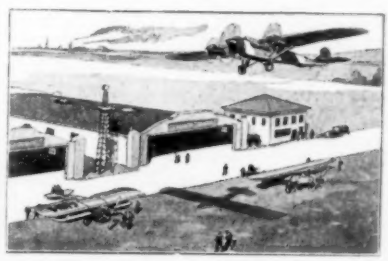

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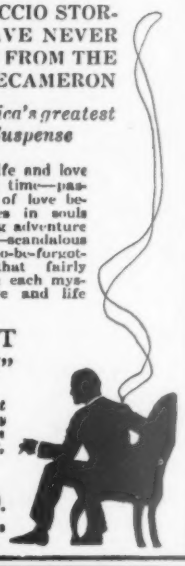

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Pusher Type

(Continued from Page 45)

the water on the hull drags water after the ship (the wake), and when the propeller works on this wake stream it gains just that much more effective velocity. For example, if the propeller were in front of the ship, tractor fashion, then the effective propeller stream translation would be the same as the ship velocity for the propeller would be working on "undisturbed water." However, if the speed of the wake dragged after the ship, were 5 miles per hour in the direction of travel, then the propeller would be just 5 M. P. H. more effective, or else the pitch speed would be reduced just that much, thus saving power. A marine propeller is never placed in front of a ship in tractor style.

In the diagram, the propeller slipstream is indicated by the arrows (p-p), while the air acted on by the wings passes over the wings and is then pulled after them by friction as is indicated by the forward trend of the "wake" at (a-a-a-a). It should be particularly noted that the viscosity or "stickiness" of air is very much greater in proportion to its density than water, hence the air wake following an airplane is a much more effective medium for the propeller to work in than the wake of water following a steamer. If, for example, the speed of the plane is 100 M. P. H. and the velocity of the

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wake (a) is 30 M. P. H., then the pusher propeller is effectively working against; 100- 30=70 M. P. H. instead of the full 100 M. P. H. as with tractor blades at the front. The wake is therefore a real advantage.

It is well known that the lift of a wing is mostly due to the reduction of pressure on its upper surface, a partial "vacuum" really existing on the top of the wing that might be said to "suck" it up. In the pusher type shown here, there is nothing to interfere with the normal functioning of the wing, but in the case of the tractor, the propeller throws down a stream of air on the top of the wing that destroys the vacuum and the lift over a considerable area. This is not a theoretical loss, it is an actual loss, and further exaggerates the engine counter torque effect that tends to turn the ship against the rotation.

Measuring the slip-stream from a tractor propeller we find that its velocity is about 30 percent greater than the actual speed of the airplane, hence if the plane is sailing along at 100 M. P. H., the slip-stream velocity in the rear of the propeller will be about 130 M. P. H. As this tractor slip-stream passes over the fuselage, encounters much bracing and also strikes the extended cylinders of the radial type engine, it is evident that the head resistance is very much increased with a tractor arrangement. Assuming the forward speed of the ship at 100 M.P.H. and the slip-stream velocity at 130 M. P. H., the resistance of parts in the slip-stream is increased 1.7 times owing to the fact that the resistance increases as the "square" of the velocity. With a pusher type there is practically nothing in the high velocity slip-stream so that this loss is reduced proportionately.

Again, it is almost self-evident that the two tubular tail booms are much lighter than any possible extension of a fuselage for carrying the tail surfaces, and because there is little vertical side area, there is a much less tendency toward spinning. As a matter of fact, spinning was practically unknown until the advent of the tractor plane.

Do you own a homemade airplane or glider? Have you discovered a contrivance or attachment that will assist amateur flyers? If so, send photos and descriptions to Popular Aviation. All material accepted at regular rates.

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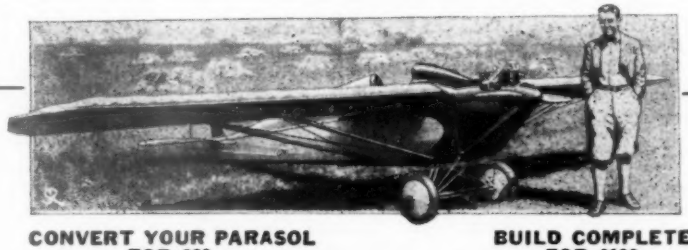
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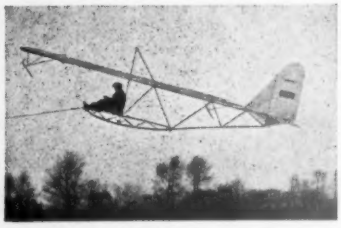
If you've never won before here's your chance For years we have awarded large cash and auto prizes to get publicity in new communities, but have given only one first prize at a time. Now, in our latest advertising plan, we want publicity in several communities at once. You and nine others now can each get one of ten big first prizes. Just think—not one but ten equal rewards of $600.00 each or, if you prefer, a brand new 1930 2-door Chevrolet Sedan, delivered by your nearest dealer. No other advertising plan like it. It is new and you can see for yourself how easy it is to be one of these ten lucky ones. Before now, you may have thought you couldn't win a first prize because someone else would be quicker on the trigger and beat you to it. But surely you can be one of the first ten, now. If you are, you'll receive exactly the same big prize as if you were the very first one.
FIND THE TWINS
Be careful. Don't lose your chance. Study the thirteen heads shown here. They all appear different, but two are exactly alike—TWINS! Look at the hat crowns, hatbands, necklaces. The under side of the hats of some are part black and some all white. Each girl has a name. If you can find the twins, send me the names of the two girls who are twins. Mail a post card or letter with the names or mark them with a cross, but be quick.
ALSO 10 EXTRA PRIZES $50.00 EACH FOR PROMPTNESS
making the total of each of the 10 First Prizes $650.00 or a Chevrolet Sedan and $50.00. If you have the right twins you will be qualified for this opportunity and may receive prize or cash. Duplicate prizes in case of ties. Send the names at once. No more puzzles. No obligation. Send no money, but HURRY!
J. F. LARSON, Room 39 54 WEST ILLINOIS ST., CHICAGO, ILLINOIS
FLO BAB LEA KAY
SUE PEG PAM LOU MAY DOT EVA ADA ANN

LEARN TO FLY IN A

WACO GLIDER

It's a fascinating sport and an easy way to get flight training at small expense



The WACO glider is built to WACO standards and has many superior design features. It will take-off and land at 20 m.p.h. and has a gliding angle of 15 to 1. It is priced at $385 complete, boxed for shipment, f.o.b. Troy, Ohio . . . or $295 partially assembled, ready for wing covering and doping.

ARE YOU one of those who now believe that flying is not such a superhuman accomplishment after all? . . . and would you like to prove it?

One of these primary training gliders by WACO is your opportunity. You can easily and quickly get the feel of the controls and the thrill of flight, and have a tremendous lot of fun in doing it.

The price of the WACO glider complete, ready for rigging, is only $385 . . . less than the average fee for primary flying instruction. A few of you can get together if you wish, form a Glider Club, share the price of the Glider . . . and the fun is on.

A Glider Built by WACO

The WACO glider is such a craft as you would expect of WACO. The fuselage is welded of aircraft steel tubing. It can't splinter. It is braced to withstand the most abusive handling. The wings are constructed of best aircraft stock, according to best aircraft practice. Wing skids with rubber shock cord protect the wing tips from damage and support the wings when the glider is at rest. The positive, fool-proof towing hook is of novel design. In every detail the WACO glider reflects the practical experience of WACO designers.

Send for Full Details

Send for descriptive folder just off the press. It will tell, too, about forming a Glider Club. Send for your copy of WACO folder GA . . . today.

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WACO AIRPLANES

0-15

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It is Wonderful Sport, and Glider Enthusiasts Proclaim it REAL.

THE AEROBAT, can be equipped with pontoons for water or wheel for land. ALL-METAL CONSTRUCTION. 40' Span 16' long weight 126 pounds.

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DEALERS WANTED

Glideoplane Company
Builders
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Missing Pilot

(Continued from Page 52)

of the camp with his good humor and clowing. He bolstered the morale.

Then there was a little break in the weather and the veteran Crosson and the youngster Gillam hopped off for North Cape, Siberia, where lay the ice-bound fur ship Nauk, which Eielson was trying to reach when lost. Half way to North Cape they encountered fog and became separated. Gillam drove through and reached North Cape a day ahead of Crosson, who landed to await a clearing of the fog. Meanwhile, at North Cape, Gillam made the first search by air over the region in which Eielson was believed to have come down.

With the arrival of Crosson the search by plane broadened and eight flights were made as weather permitted, and on the eighth, the wreck of the Eielson plane was discovered.

Needless to say, Gillam has been made a regular member of the little group of Alaskan Airways pilots.

Gillam, Major Deckard said he was told, took to flying like duck to water.

"They tell me he is one of the few who seem to be natural born fliers. When he has had 1,000 hours he probably will be as good or better than most of our 5,000-hour men."

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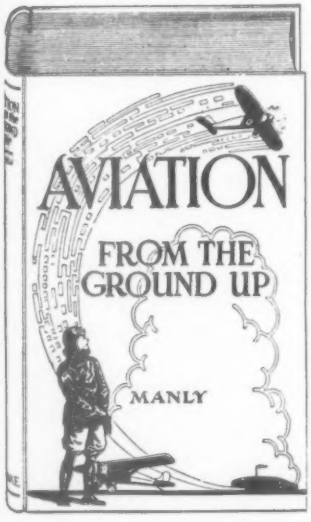

By Lieut. G. B. Manly, U. S. Army Air Service, Res. It is very complete, and gives thorough and practical information on every phase of the subject, "From the Ground Up." With this one book you can be thoroughly posted in Aviation.

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(Continued from Page 54)

on the battle front, or a great surgeon, and her courage and poise would not have weakened.

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DO YOU KNOW YOUR PLANES?

The planes pictured on page 29 are:—1. Arrow Sport; 2. Great Lakes Trainer; 3. Spartan C-4-225; 4. Alexander Bullet; 5. Fairchild KR-21; 6. Inland Super-Sport; 7. Consolidated Commodore; 8. Fokker F-32.

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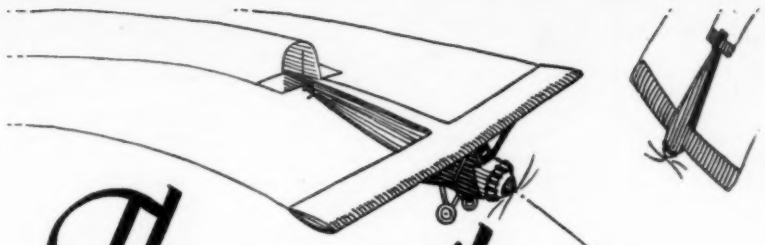

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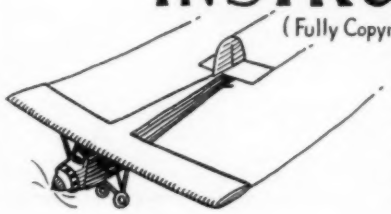

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Address: Rankin System, Inc., 1311 Edwards-Wildey Building, Los Angeles, California.

Carrier Pilots

(Continued from Page 40)

cause of any delays. This tabulation is of great interest and pilots who have already landed are frequently found looking at this impartial record to see who was "fast" or "slow" and how the operation in general compared with the usual standard.

Two motion picture camera operators are also visible with their machines placed at points of vantage. These are ultra-rapid cameras used entirely to obtain a photographic record of any accidents which may occur. The usual normal landing is ignored but if some pilot comes aboard in an erratic manner, resulting in a crash landing, there is always a camera going and the film shows what happened. These camera men possess uncanny perception and seldom fail to detect a potential crash before it occurs. The resulting record is an invaluable aid in determining the basic cause of trouble. Incidentally this record is alibi proof and in cases where the pilot is at fault, furnishes incontrovertible evidence.

FORCED landings in the open sea with these seagoing land-planes are fortunately not frequent, but now and then they do occur. Engines have a nasty habit of stopping at embarrassing moments so occasionally some unfortunate pilot finds himself headed for a ducking with a dead engine up in front. As the plane lands he pulls a control wire in the cockpit which releases gas from a high pressure carbon dioxide flask into two or more large balloon-like rubber bags fitted into the wings or on the side of the fuselage. These are an enlarged version of a child's "water wings" and are used in much the same fashion to keep the airplane afloat. Stowed in the fuselage is a collapsible rubber boat, and a small air flask to inflate it. There is also a paddel which is jointed like a fishing rod, a smoke signal, emergency rations, a rocket pistol, signalling flags, and other miscellaneous emergency material.

Sometimes in the past, emergency flotation equipment has failed to work and the pilot has had his plane sink very quickly after landing. Such being the case his only salvation is a life jacket (worn constantly when flying over the open sea) and the amphibian rescue planes which are provided for just such an emergency. Fortunately modern emergency flotation equipment has proven very effective and planes which have been forced down have remained afloat long enough to not only rescue the occupants but to enable the carrier to salvage the airplane as well.

THE scene on deck at a night launching of four full squadrons is a sight long remembered by those who are fortunate enough to see it or to take part in it. Spectacular though daylight operations are, the night flight is in a class by itself and has no parallel anywhere. The throbbing, deafening roar of many engines is once more present, but this time little can be seen except the blue exhaust flames from the cylinders of all the engines as they are run up prior to taking off, the glistening reflection of this ghostly light on the propellers and the somewhat indistinct outline of the airplanes. The entire deck seems to be covered with intermittent circles of blue flame. This, added to the noise and intense activity lends a touch of weirdness to the scene.

Navigation and signal lights flash on and soon the planes are on their way with exhaust flames changing to red when the engines roar as each plane rolls up the deck gathering speed to take off and promptly disappear into the darkness.

Night deck landings on carriers are the absolute ultimate in skillful flying. Here is a real job for a master pilot with a "smooth" stick hand and iron nerves. Such operations are not routine but must be provided for in the event of planes returning after nightfall or in case of emergency landings after a night launching.

Eugene Ely certainly started something when he landed his Curtiss airplane on a platform aboard the U. S. cruiser PENNSYLVANIA the morning of January 21, 1911. His spectacular "stunt" was for that time a phenomenal performance which continues to claim the respect and admiration of naval pilots who follow the sea in airplanes and ships.

PERFORMANCE-SAFETY-ECONOMY

This unretouched photograph shows a standard Rhon Ranger carrying two men after a launching from level ground with ordinary ½ inch shock-cord. (See page 32)

Rhon Ranger Prices
(F. O. B. Chicago)

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The "Rhon Ranger" offers you outstanding performance whether it be in flights for duration, distance, or altitude, for the "Rhon Ranger" has the lightest wing-loading of any training glider ever offered.
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And in addition to these superior features Rhon Ranger offers you detachable pontoons, available June 15th, either knock-down or ready-to-float. Send 10c for descriptive folder and installment purchase plan.

MEAD GLIDERS

Dept. E, 12 South Market Street, Chicago, Illinois

Converted Ford

(Continued from Page 46)

was found which could be used. A lighter rocker arm was later designed and is recommended.

The use of this camshaft permitted the use of the standard Model "A" camshaft gear and crank shaft pinions. No change was made on the camshaft gear, but the crankshaft pinion was drilled for lightening.

Test determined the Ford connecting rod and wrist pin could be used by making a slight change on the wrist pin bearing and sealing the oil holes and grooves for pressure lubrication.

The crankcase, top half is made from aluminum alloy heat treated and well designed for strength and lightness. Many ribs are placed within the case to absorb all motor strain. The external appearance of the case is smooth and symmetrical. The oil lines are all cast in the case.

The crankcase lower half is aluminum alloy; in the wet sump type being of 2½ gallon capacity. This can be removed for inspection of bearings without disturbing the engine mount.

A dry sump lower case with scavenging and pressure pump can be supplied for stunt flying.

The oil pump is driven from the camshaft with standard Ford drive pinion. In the wet sump design the pump is immersed in the well and surrounded by a screen which is removable thru the bottom inspection plate.

The cylinders are made of chrome nickel semi-steel with the head cast on in corporating the best design in a domed combustioned chamber. Top over haul by removal of a cylinder can be accomplished with an end wrench, removing only six nuts per cylinder.

The valves are of extra large area and are made of silicrome steel. A standard Indian valve can be used efficiently by making a slight change at the top of the valve stem and using special bushings. The rocker arm support is of molybdenum steel heat treated, this support carrying a sturdy hardened and ground bushing assembly which contains an extra large grease reservoir for rocker arm lubrication. This reservoir is filled by a Zerk fitting, one fill being sufficient for 100 hours.

The pistons are of trunk type, using a special aluminum nickel alloy heat treated, with three rings above the pin. One ring is oil regulating.

Dual ignition thru two spark plugs per cylinder is supplied by two magnetos. The magnetos are end mounted and are driven directly from the crankshaft at engine speed. Either Scintilla or Robert Bosh magnetos can be used. These magnetos are standard and can be purchased from the regular service stations.

A starter attachment can be supplied at extra cost; this drive being taken off the crankshaft between the magnetos. The makers intend to market this motor completely assembled and tested at $500.00. The complete engine unassembled will be sold for $400.00.

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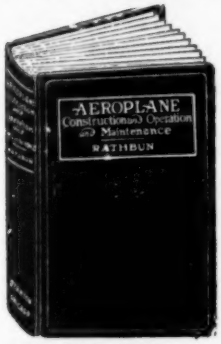

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Practical Flying

by Major B. Q. Jones, Air Corps, U. S. Army. **210 pages, 6 illustrations, $3.00**

This manual is a time-tested statement of what to do and what not to do in flying. First, Major Jones, famous as the Chief of Army Aviation Training during the war, describes the qualities desirable in a pilot. Then follow chapters on planes, instruments, technical and slang expressions, plane parts, pilots' equipment, methods of plane inspection, and rules for testing the controls and the motor. Then Major Jones tells you all about the actual technique of taxying, the take-off, climb, straight flight, turns and banks, glides, recognizing and correcting for stalls in their early stages, and for getting out of spins. The book throughout stresses safe flying by the observance of common-sense, practical rules.

The Navigation of Aircraft

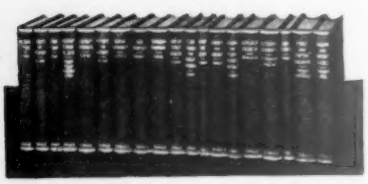
by Lieut. Logan C. Ramsey, U. S. Navy; Instructor, Naval Air Station, Pensacola, Fla. **237 pages, 51 illustrations, $4.50**

This book is a practical discussion of the aerial navigation actually used in ordinary, everyday flight. It sets the proper balance between the three branches of avigation—piloting, dead reckoning, and aerial astronomy—something no other book accomplishes. In addition to its major presentation of the principles and practice of position finding by calculation and observation, it covers fully the mechanical aids of navigation; navigational procedure in practice; general advice and equipment; blind flying; application of weather reports and data to navigation; etc.; etc. Although very recently published, this manual has already been selected by many leading schools as the one book on aerial navigation satisfactory for their students.

Airplane Mechanics Rigging Handbook

by R. S. Hartz, formerly Lieut. Colonel, Air Corps, U. S. Army; and E. E. Hall, Lieut., Air Corps Res. **267 pages, 104 illustrations, $3.50**

Licensed mechanics and men who want to qualify for this important work will find all the practical details of their job covered fully in this manual. The authors have had years of experience in Army and civilian flying schools. They show you just how to get an airplane into flying condition and how to keep it that way. The instructions are given in detail, covering the care and inspection of airplanes; dismantling an airplane; stresses and strains; four methods of rigging; sequence of rigging steps; truing up the fuselage, the center section, and the wings; adjusting the angles of incidence, dihedral, etc.; overall adjustments; spars and struts; splicing and fitting; controls and corrections for instability; practical hints for riggers; inspections; installation and correction of compasses; etc.; etc.



Aircraft Power Plants

by E. T. Jones, formerly Chief Engineer, Wright Aeronautical Corporation, and other experts. **208 pages, 104 illustrations, $4.25**

Written for students, pilots, and engineers who need information on engine principles; a frank discussion of their favorable and unfavorable features; the performance characteristics that may be expected; and a description of engine accessories.

The book explains and compares performance characteristics of engines and accessories. Points out adaptability for various purposes with practical notes on their operating features. The various kinds of heat engines are clearly explained and compared without going into thermodynamic formulas. The section on propellers includes engineering formulas and plan-forms sufficient for design of ordinary types. Sequence of operations necessary in design computations included. The accessories described include ignition systems, carburetors, fuel piping, pumps, reduction mechanisms, superchargers. Valuable information is given on lubrication and quality of engine fuels.

Aircraft Instruments

by H. N. Eaton and other experts of the Aeronautic Instruments Section, United States Bureau of Standards. **269 pages, 68 illustrations, $5.00**

For students, pilots, mechanics, engineers and designers. The only book of its kind in America. Describes over 175 types of aircraft instruments—practically every kind in use—giving a summary of their operation, advantages and disadvantages of each, practical advice on installation, care, and manipulation.

Covers thoroughly classifications; transmission systems; instrument boards; altitude and climb instruments; air and ground speed instruments; direction, position, and altitude instruments; power plant instruments; manometers; navigating instruments; specifications; etc., etc.

Simple Aerodynamics and the Airplane

by Charles N. Monteith, Chief Engineer, Boeing Airplane Co.; 3rd edition revised by Colonel C. C. Carter, U. S. Military Academy, West Point. **418 pages, 211 illustrations, $4.50**

A completely revised and enlarged edition of a famous introductory textbook widely used in ground and flying schools, in colleges, technical schools and universities. It is ideally suited to home-study use.

Includes a general discussion of airplanes; characteristics and types of airfoils; explanations of lift and drag; center of pressure and its movements; plotting of coefficients and characteristic curves; distribution of forces; selection of airfoils; rate of climb; landing speeds; combining air foils; parasite resistance; characteristics of aircraft engines; discussion of component parts of an airplane; stability considerations and its attainment; control surfaces; the propeller; airplane performance; dynamic loads, maneuverability and controllability; structural considerations; wind tunnels; discussion of airplane types for specific performance; methods and instruments for navigation of aircraft; airplane accessories; parachutes; radio; aerial photography; etc.; etc.

Airplane Stress Analysis

by Alexander Klemin, Professor of Aeronautical Engineering, Daniel Guggenheim School of Aeronautics, New York University. **277 pages, 105 illustrations, $7.00**

In this introductory treatise, Professor Klemin shows step by step how to make all the calculations in the airplane stress analysis required by the Department of Commerce. The book is intensely practical—each point is explained with the utmost clearness and simplicity; advanced mathematics has been avoided so far as possible. To show the reader just how the calculations are made in actual practice, Professor Klemin takes an airplane of average characteristics and gives full examples of all the computations required. A preliminary review explains the principles of applied mechanics involved. In concise, easily usable form, data on materials of aircraft construction to which the calculator must frequently refer, are assembled for convenient reference.

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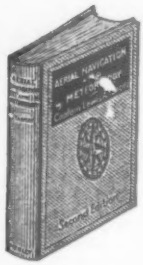

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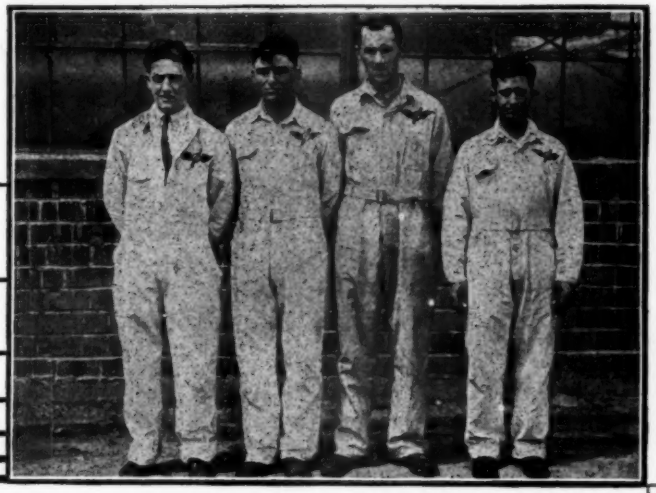

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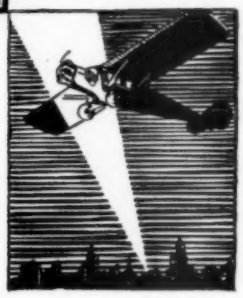

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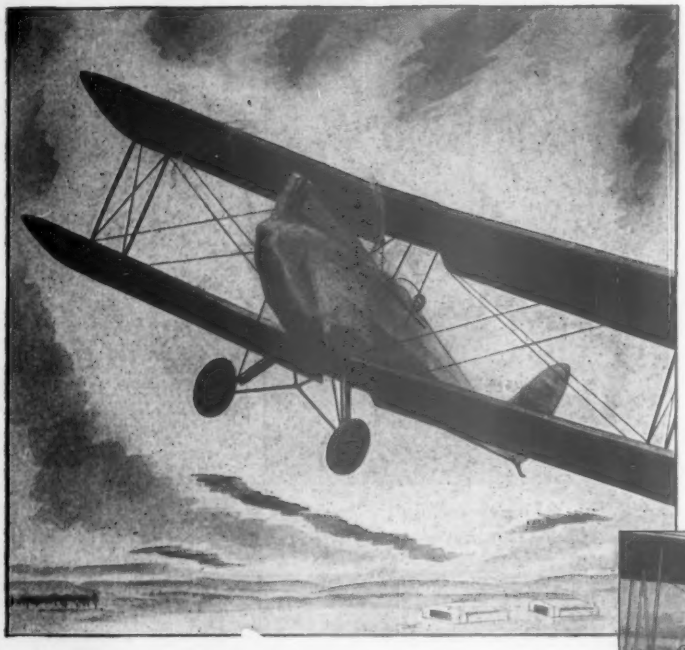

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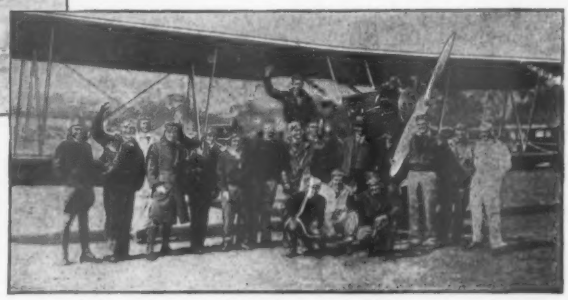

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